

THE *Geography vol. 1.*
DESCRIPTION and USE
Of that most Excellent Invention, call'd the
GLOBULAR CHART:

Shewing its Agreeableness to the

G L O B E,

And the Natural and Easy Consequences thereof in the Practice of

NAVIGATION;

With a *Specimen* of a SEA-CHART in that Projection; and Trigonometrical Calculations, to prove the Truth thereof, both in Course, Latitude, Longitude, Meridian Distance (or Departure) Distance in the Arch of a great Circle, and Distance in the Rumb, tho' so Extensive as to exceed 1200 Leagues; and all measur'd by a Scale of Equal Parts, which cannot be done upon any Projection but this only.

To which is prefix'd an

A N S W E R

To Mr. HASELDEN's Letter to Dr. HALLEY,

Proving by Mathematical Demonstration, that his Principal Argument is false by above Three in Five; the rest invalid, and the whole incoherent.

With an APPENDIX, containing an Answer to Mr. COLLIER, and proving that these two Authors contradict themselves, and one another.

By HENRY WILSON, *K*
Late Mathematician in His Majesty's Navy, and Author of several Treatises, in Navigation, Astronomy, &c.

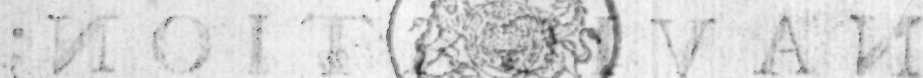
L O N D O N :

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August.

Of that most Excellent Invention, call'd the

Showing its Agreement to the



With a Division of
Section; and The one which
thereof; said in County, England.
fact (or Document) Distance in the Area of Interest. Dis-
cle, and Distance in the hands of the Executive as to interest
also Learning; and all means by which the public mind may
which cannot be done upon any other plan.

To which is well

A. M. S. W. E. R.

To Mr. HASTINGS, I offer you the following

W. L. G. APPENDIX, continued. (continued from p. 100)

By HENRY WILLSON

The Manuscript in His Majesty's Library at Windsor Castle

100-100000

[illegible]

TO THE READER.



THE Globular Projection of Sea-Charts (the Truth and Advantage of which has of late incited the Expectation and Desire of many able Navigators to see it finish'd) was begun about four Years ago; but the Work was retarded by my going to serve the Right Honourable Sir GEORGE BYNG, in the Quality of Mathematician, a-board of his Majesty's Ship the *Barfleur*, in the Mediterranean. However, after my Return, we made a further Progress in the Work, which met with such General Encouragement, that it even engaged us to proceed; and in a short Time we produc'd such Specimens as had the Approbation of Learned and Impartial Men, as a great Improvement in Navigation, especially in that useful (but hitherto intricate) Part, viz. Sailing by the Arch of a great Circle.

UPON this we were further encourag'd to finish the several Parts of the World upon that Projection. But we apprehending that there are those in London, or near it, that would not be wanting to copy us, and thereby reap the Benefit of that useful Improvement, which we had been at the Pains to invent, and render practicable, we applied our selves for the obtaining Letters Patent for the sole Performanse thereof, which his Majesty after a due Deliberation was pleas'd to grant us, whereby any Design of copying us, was totally prevented.

NOW (as the Fox in *Æsop's Fables* said of the Grapes) the next Artifice is to render the Whole of no Value. A pretty Contrivance indeed, if the World would believe it, which they would sooner do, could they first convince them, that this Terraqueous Body, upon which we live, is not Globular; but despairing of that, the next Attempt is to make them believe, that this is not New, with respect to Navigation, which it is evident is the last Shift (except downright Violence) that any Persons of a contrary Interest can express. Nor can we expect that any will oppose it, except such with whose private Advantage this publick Improvement may interfere. However, for the Satisfaction of all indifferent Persons, the following Treatise is publish'd, to prove whether it is not New, True, and Practicable; which when granted, it will easily appear, upon what Principle those Peoples Arguments are grounded, that represent it, or procure it to be represented otherwise. But it is natural for Persons that rest in a certain Pitch of Acquirements, or that prefer their own private Interest before a Publick Good, to endeavour to stifle any thing New, how excellent soever: Nay, the more excellent, the more oppos'd; because it the more irritates the Gall of those who (like the Dog in the Manger) neither make Improvements themselves, nor willingly suffer those that would; or of those who have no higher Aims than to cut down the publick Interest, purely to prop their own, as one of their Vassals was pleas'd to express it in a printed Book: An Answer to which you will have in an Appendix to this, in which we see what dull Instruments and weak Efforts some People will use to maintain their own private Ends, tho' against a Publick Good.

WHAT could have been expected of such Persons, had they lived in Mr. Wright's Time, when his Projection (commonly call'd Mercator's) was offer'd to the Publick; in which the Projection differs so much in Appearance from the Surface of the Globe, as (notwithstanding the true Proportion retain'd therein) might have been a sufficient Motive to any busy Antagonist, to have made himself popular by opposing it, and de-
fending

fending the Plain Chart that was then generally receiv'd as the best Way, and had stood the Test of many Years? Which is the very first Argument, with which our Author defends Mercator's Projection, at the same Time depriving it of some Excellencies, that it is really capable of; for I always look'd upon Mercator's Projection, as a good Supply of those Deficiencies which Navigation labour'd under, when only the Plain Chart was known, and till better could be provided (as Mr. Harsden owns, I did in Page 8. of his Letter); and in this I fell directly in with Cogniet; for Blundevile speaking of the preposterous Appearances of Right-lined Projections, says, For the Redress and Remedy of which Faults he (Cogniet) hopeth to find out a more perfect Rule of making Charts, when Opportunity of Time shall serve. In the mean Time Mercator hath made the Spaces of the Parallels of Latitude to be wider every one than another from the Equinoctial towards the Pole, &c.

See Blundeviles Exercices, Chap. 28. of his Art of Navigation.

SO long ago it is, that the Industrious have been aiming at true Projections; and Cogniet and Blundevile reckon other Improvements but as Substitutes or Preparatives to this final one, which they aim'd at, and which can never be compleated, without representing the Surface of the Globe like what it is, which would be allowed in all other Cases, and why should it be deny'd in this?

'TIS wonderful to me, that any Man that pretends to be an Artist, and has observed how industriously many generous Spirits have within these few Years contributed to the Improvement of all the several Parts of Mathematicks, should suppose that Navigation only is arriv'd at its Ne plus ultra, and not only deny all further Improvements, but undertake to reprove Dr. Halley for encouraging any: When first, the finding the Longitude at Sea, remains so imperfect; and secondly, when we never till now, had any Sea-Charts publish'd, that appeared like the Surface

Surface of the Globe (upon which our Navigation is performed) or that could be measured by a Scale of equal Parts.

I shall not in his own Language call it superlative Insolence, because (as Doctor Halley observ'd, occasionally, upon reading his Letter) they that have the worst Cause, commonly use the most opprobrious Expressions in managing it: But the Doctor gives me leave to tell them, that he can easily wipe off all the Dirt (tho gilded with a few handsome Encomiums) they have endeavour'd to cast in his Face; amongst which is this Aspersions, in Mr. Haselden's own Words; Our celebrated Dr. Halley was not a little delighted with himself, when he had only found out an easy Demonstration of the Analogy between the Logarithms, Tangents, and the Meridian Line, or Sum of the Secants, a Thing known 50 Years before, &c.

I might ask thus; if it is not Dr. Halley's Invention, Why should he be so delighted with himself upon it? But if it is, Why should Mr. Haselden say it was known 50 Years before? But we hope notwithstanding, the Doctor will justify himself from all their subtle Aspersions, and vindicate what he has done, in a Preface to the Globular Atlas, writ by his own Hand; which Atlas shall answer the Conditions of the Proposals, and the just Expectation of the Subscribers, notwithstanding what may be said against it, by those with whose Interest it interferes, or by those who are conscious of their own Inability to perform any thing like it; this Projection alone having these Excellencies.

First, THAT it is capable of expressing the several Parts of the Surface of the Globe in their true Position and Magnitude, with respect to one another.

Secondly, IT is to be measured by a Scale of equal Parts. These two Properties, the chief End and Design of Sea-Charts, and without which, Navigation (especially the Practical Part thereof) must remain either imperfect or troublesome; not being to

be perform'd upon any Sea-Charts yet invented, but peculiar to the Globular Projection only.

I F Mr. Haselden would insinuate that in Strictness, it is impossible to represent the Surface of the Globe truly upon a Plain; but that some Part will be extended, or some contracted: I answer, we have done the Parts thereof so true as to bear measuring, to answer Calculation, and consequently to serve for all Purposes in Practical Navigation, which is what we aim'd at, and the World expected; and if Mr. Haselden would prove this Exactness insufficient in Practice, and think it worth his while to employ his Pen against it upon that Account, he might have found Employment of that Kind long ago in Writing against the Proportion (yet found) of the Circumference to the Diameter; or the many Steps made use of to approach the Root of a surd Number; because the exact Truth is not attainable in either. Had he writ against them too, he had merited the Contempt of all able Mathematicians in general, as he has now of those that allow themselves to understand the Facility, Truth, and Usefulness of the Globular Projection.

I shall add no more; but only appeal to all impartial Artists, that have seen both Mr. Haselden's Book and mine (for those are the proper Persons) whether I have not, First, made good what I propose in my Title-Page; and Secondly, whether (then) those that oppose us, be not acted by a Principle of Self-Interest only, without any regard to a Publick Good.

HENRY WILSON.

7
Lately Published
PROPOSALS

For Printing a COMPLETE
SEA-ATLAS,

From a True Globular Projection;

Approved by several of the Ablest Judges of Navigation and Astronomy,
and warranted by his Majesty's Letters Patent under the Great Seal of
Great Britain, granted to J. HARRIS, J. SENEX, and H. WILSON.

CONTAINING

The best Description of all the Ports and Harbours in the World:
With the Soundings, Land-marks, Light-houses, Beacons, Buoys, and whatever
else is necessary for conducting a Ship in or out of the same: Together with
an Account of the SEA-PORTS, as to their Situation, what Navigable Rivers
flow up to them; of their Trade, Shipping, Product, Manufactures, Customs, &c.

To which is prefix'd

A General TREATISE of NAVIGATION,
Wherein the necessary Rules and Tables, for Supplying the Use of all other
Books of that Kind, both in Theory and Practice, will be included.

The Whole submitted to the Inspection and Approbation of Dr. Edmund Halley,
Regius Professor of Astronomy, &c. who has promised to Revise the same.

I. **T**HAT the whole Work shall contain about 150 Sheets; 50 of which will
be Charts engraven on Copper-Plates, each of which Charts will be at least
as chargeable as two Sheets of the printed Matter, and make the Book equal to Two
Hundred Sheets.

II. **T**HAT it shall be printed on the same Character large Paper with the forme
Proposals.

III. **T**HAT in several of the Charts there will be Plans engraven of the
most noted Harbours in the World.

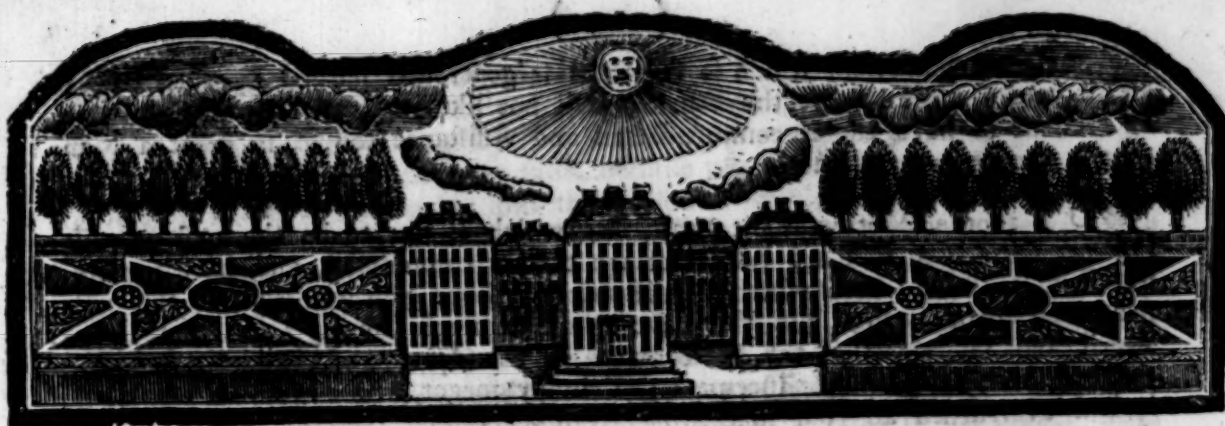
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V. **T**HE Names of the Subscribers to be Printed, and their Arms Engraven,
before the Book, as Encouragers of so useful a Work.

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SUBSCRIPTIONS are taken in by the Patentees, and their Assigns; viz.
JOHN SENEX, THOMAS TAYLOR, WILLIAM TAYLOR, WILLIAM INNYS,
ANDREW JOHNSTON: As also by HENRY WILSON at the *Globe* in the *Little*
Minories, J. HARRIS Engraver and Printer near the *Royal Bagnio* in
Newgate-Street, and EDWARD SYMON in *Cornhill*;

And by most Booksellers in *Great Britain* and *Ireland*.



A N
A N S W E R
T O
Mr. *Hafelden's* Letter to Dr. *Halley*, &c.

Mr. HASELDEN,



HAVE seen your Letter to the Celebrated Dr. *Edmund Halley*, in which you tell him in Effect, that you bear his great Character prostituted to a vile Purpose. Will you infer from thence, that we have done without his Authority, what you call prostituting his Name; or would you basely insinuate, that (which I am ashamed to mention) he had some vile Purpose in view, when he gave us that Liberty: The latter sure you will not be so ungenerous as to surmise; and for the former, we can sufficiently justify our selves, as you seem to grant, because you say, *Either our Importunity or Indigence, or what other Motive, you know not, bath prevail'd upon his good Nature, to give us a recommendatory Certificate, &c.* I wonder at your Front in sending such an inconsistent Letter to a Gentleman, on whom (not undeservedly) you bestow the greatest Epithets, and yet now would make that Learned Gentleman so inconsiderate, as merely by Importunity to be prevail'd upon, to recommend so mean a Performance as you would make the World believe it is; but if *Indigence* was the chief Motive, you will suppose we sued for Assistance as

B

well

well as Recommendation, which so far as he is generously pleased to contribute, I assure you, I (nor I hope the World) will not like it the worse, but think it an Honour to have the Recommendation and Assistance too of so great a Man to any Performance of ours.

BUT another Motive might occur, and which is like to be the most prevailing one with Men that are Judges of what they recommend, and have no sinister End, to serve (both which Qualifications I hope you will allow to this eminent Gentleman, with whom you have taken so much Liberty) and that is the Merit and Usefulness of the Performance in the Opinion of impartial or disinterested Men: But this Inducement you wisely forgot, which had you mention'd, it had overturned all your succeeding Arguments, and therefore you prudently say, (*or what other Motive I know not*) but by the Way, Sir, suppose you do not know what other Motive it was, would you from thence insinuate to the World, that he himself did not know his own Reason for what he did, if not, you must suppose it a Blemish in his Character, which with the like Sophistry you have told us if we had known of, we ought indutiously to have conceal'd; but if you will allow that what was done was with the prudent Consideration becoming so great a Man, the poor Aspersions of an obscure Schoolmaster (who whether his own Master or another Mans Vassal we know not) can do no Damage to Truth and self Evidence.

BUT (to pass by such trifling Reflections with which your Letter is not only introduced, but interspers'd) I shall come to the Matter in hand; and although my chief Design herein is to justify the Excellency and Usefulness of the Globular Projection, yet to do my self and the World Justice, I beg Leave to give my Reasons for what you repeat in Page 2 of your Letter about *Mercator*.

YOU say, I represented it as puzzling, difficult, and false: There is no such Word in our Descriptions, nor in our Proposals, but I said in Mr. *Hodgeson's* Company, when we were together, and you present, that it is, 1st *Aburd*, 2ly *Difficult*, and 3ly *Deficient* (these were my Words) and then proceeding, 1st, *It is absurd, because its very Foundation is so; for before you can form any Conception of the Mercator's Projection you are oblig'd to suppose the Teraqueous Globe to be what you know it is not, &c.* 2ly, *It is Difficult*, because by the supposed Distortion of the Globe, the Parts remoter from the Equinoctial are so extended, that it cannot be measured by the same Scale of Equal Parts. 3ly, *Deficient*, because the following easy Question I had before upon that Occasion propos'd to Mr. *James Atkinson* Senior (then living) but found the very same in Mr. *Hodgeson's* hand, the Question being this: A Ship at B in Latit. 60, and an Island at C in Lat. 70, both under one Meridian; the Ship sails from B, N. E. into Lat. 70, I desire to know how many Miles he is (in a Parallel) from the Island at C, could not thereby be truly answered.

NOW Sir, these three were what I said, which (by the way) you only mention in your Letter, without any Defence against the Charge. Pray Sir, if my Assertions were false, why did not you confute them in your Letter? If they are true against Opposition, what signified your mentioning them? Or, why do you charge me to the Doctor and the World with *superlative Insolence*, for telling the Truth, or at least, for telling what may be true, for any thing you can say to the contrary? As also, what

what follows about its being false one Mile in six, in Cases that I could relate ; which also you only mention, without satisfying the World, whether my Assertions are Right or Wrong ; for if you say they are Right, you overturn your own Argument, and you cannot say they are false, because you heard me prove the first three by Arguments now mention'd ; and the Reason of my saying, that the Operation by Mercator is false, by one in six, in some Cases, was the answer to the foregoing Question, which being North-East, the acute Angles are equal and consequently the difference of Longitude, is equal to the meridional difference of Latitude. viz. 1439 Min. which reduced to Miles, in the Parallel of 70, is 492 nearest ; but the Line which in the Mercator's Triangle, is said by Mr. Seller, Mr. Gellibrand, Mr. Newbouse, Mr. Atkinson, and by all School-masters that I know of, in their teaching to represent departure or meridian Distance, is equal to the proper difference of Latitude in a North-East Course ; and therefore in our Question, it is 600 differing from the former 108. viz. more than one in six, and this you knew Sir, was my Way of proving it ; now if you will grant that Meridian Distance or Departure (which I call the same) is the Distance in a Parallel from the Meridian departed from, and can find any Thing in this Operation unjustifiable, Why did not you rather supply the Place of your scurrilous Language, with letting the World know, that what I had said, was unjust and false, as I Question not, but you would, had you been able ? but instead of that, you have upon this very Question, shuffled from Shelter to Shelter, which I shall here take Notice of : And

1, I Question not, but that you teach your Schollars, to call the shorter perpendicular the Departure, according to what is asserted by the abovementioned Authors, in their Books of Navigation, and commonly taught in Schools.

2, W H E N you found that would not serve your End, in answering the abovementioned Question by Mercator ; you told me, there were three sorts of Departure (you did well to take so many ; it is a wonder if some of them would not fit the Place) and whether one of these three were right or not, I cannot remember, but it would seem not : For

3, Y O U say in your Book, that there is no such Thing as Departure ; or in your own Words Pag. 12, *That this Chart hath no such Thing, as is commonly signify'd by the Words Departure, or Meridian Distance*, a sudden Change to be in the same Person ; first one Sort of Departure, then three Sorts, and now none at all : Or else, if you mean there is what is properly call'd Departure, or Meridian Distance ; but the Mercator's Chart, is not capable of having it express'd : It appears like an Imperfection in a true Chart, and would have been look'd upon as the Effect of prejudice in me, if I had said so : But so just have I always been to the Mercator's Projection, that I am not willing you should deny any of its Excellencies ; of which I believe it has that one among many others, that Departure or Meridian Distance may be express'd thereon, as I shall hereafter prove ; for the Notion that I have of Meridian Distance, is, that whether a Ship sails upon one Course or many, and whatever Distance she makes good, and upon whatsoever Rumb or Course (the Meridian excepted, for upon a parallel, it is all Meridian Distance) there will be an Arch of a Parallel of Latitude, comprehended between the Ship, and some Part of the Meridian departed from, which (if the difference of Longitude be known) the Miles contained in that Arch of a Parallel, may also easily be known ; and that I call Departure, or Meridian Distance ; and as the Departure is an Arch of a Parallel,

and Parallels upon *Mercator's* Projection are right Lines, and may be express'd; *Ergo*, the Departure may be express'd; pray then, Sir, do not take away one of the best Spokes in your Wheele, and then say it is better without it.

AGAIN, in Pag. 19, of your Treatise, you tell us, *how to make a Scale for measuring Distances of Places, that bear East and West off each other, on Mercator's Chart*: Now that you should publish a Scale adapted only to the measuring of Parallels, and Departures are all Arches of Parallels; why Departures cannot be measured, I do not understand? Indeed you may defend your self, by alledging, that you did not say they could not be measur'd, but that *the Chart has no Line in it expressing that Thing*: Wonderful! a Scale made and adapted to one Projection only, to Measure that, which cannot be express'd upon that Projection; nay, and which is more wonderful, it is adapted to the measuring of nothing, but what you tell us, cannot be express'd upon that Projection, for which it is made; pray Sir, what is your Scale for? or what Improvement is it to *Mercator's* Chart by your Way, of arguing?

I shall not take much Notice of your other Discourse about different Departures, according to the different Latitudes they are made in, with your learned Illustration of it, and your appeal to the *West-India* Traders, for the Confirmation of a Truth, which no Body will deny that understands the Globe, though without that, it would be hard to conceive it; and I suppose, for this Reason, you have thought fit Pag. 13, to make use of a Specimen of the Globular Projection, as the most intelligible to demonstrate that, and other Truths relating to the Surface of the Globe; and if that was the Reason, why do you so basely vilify a Projection, that your self thinks the most intelligible to Illustrate so necessary a truth as you are now asserting? But if that was not the Reason, why could not you as well have done it by the Figure, Pag. 12, which you explain, Pag. 11 and 12, only you speak too much of stretching, for every Body does not understand stretching so well as you, as I shall shew in my Answer, to Pag. 5, compared with Pag. 9 of your Letter. But to return to your Letter, Pag. 2.

YOU say, *we have other Objections against Mercator's Chart, as that it is built upon the false Hypothesis of the Globes being a Cylinder. That it is a World without Poles. That the same Proportion does not hold throughout. That it represents Places bigger than they are upon the Globe. That it is made up of a Number of Proportionable Falshoods, from which truth may be gathered although with Difficulty; and many more such trivial Things.*——Hold Sir, you take these Things too much in the gross, and wrap them all up in the Word *Trivial*, as sick Patients do their bitter Pills in Sugar, or the Pap of an Apple, and swallow them at once, lest their Physical Taste should be nauseous to the Palate; and only say, *they are easily refuted*. Well, if so, Sir, and as you are a Volunteer in the Cause, there will be something of that kind expected from you. Are they true or no, if they are, why do you say they are easily Refuted? If not, why do not you refute them? For else, they will remain more liable to be believed, than before you meddled in the Case, because you are not able to disprove what you have made your self busy to condemn.

YOU form a Question, and assume an Answer; *viz.* whether *Mercator's* Chart, will shew by a ready Method, the true Bearings and Distances of Places, &c. and your assumption is, that all that know it, will allow it does; and as my Design in this,

this, was not to meddle with *Mercator*; so I shall not now undertake to determine whether all that know *Mercator's Chart*, can by a ready Method, find the true Bearing and Distances; but if I should grant you that, I would modestly ask you, what Use your new Scale will then be of? for I presume, it is not by that, that they do it; because many know *Mercator's Chart*, that do not know your Scale, which I suppose, will not meet with universal Acceptance, except it exceed what has been, or can be done by the Helps already found; and therefore we must allow it to be quicker than Expedition, and more exact than Truth, or else it is of no Use, by your own Argument; because you assert that *Mercator's Chart*, as its Use is now known, is both true and Expeditious.

THE next Thing that I find worth observing is, *That this Globular Projection, is no new Invention*, which (omitting the Objection, which I anticipated about the Stereographick Projection) you would prove thus: *But whosoever will look into Blundevile's Treatise of Maps and Charts, printed in 1621, will there find, a Description of a Chart made by Mercator, in the Year, 1554, after another Manner*; pray Sir, what do you mean by [after another Manner] if you mean it differs from ours, it is not the same; and therefore, ours may be a new Invention for all that: But if it be the same of ours, it must bear all the Definitions of ours, which (agreeable to the Surface of the Globe) are 1, The Meridians incline. 2, The Parallels are equidistant. 3, As a just Consequence of the two first equal Quantities of the Surface of the Globe, possess equal Quantities of the Plain of Projection. 4, The Rumbs are inclining Spirals.

NOW with Respect to this Chart made by *Blundevile*, you first say, *Blundevile directs to draw the Line A B, &c.* But you (I suppose) not being able to reconcile *Blundevile's* Directions to the Surface of the Globe, say, *you conceive Blundevile has mistaken Mercators Method*; and I do not know, but you have mistaken them both; for with three Iss or Suppositions, and no Determination; but a Conjecture you leave off, and having furnished us with Directions for a few Meridians and Parallels, you in a Sort of Extasy cry out, *Here then is a Curve lin'd Chart, made 167 Years ago, the very same as the Globular Chart.* But, pray Sir, where is Mr. *Blundevile's* Directions for describing the Rumbs? If he gave Direction for these too 167 Years ago, Why did not you insert them, if he gave no Directions for them at all, as I know he did not? (having his Book by me) His cannot be said to be a Globular Sea-Chart, the very same of ours, when it wanted the very Essentials of a Sea-Chart, viz: the Rumbs, which had we sent ours into the World without, I am confident, you would have been far from thinking them worthy the Name of Sea-Charts: do not then say, that his Chart is the very same of our Globular-Chart, when you know that the Rumbs (tho' by him omitted) are the most useful and necessary Lines that can be described upon a Sea-Chart; which by his Method of doing the rest, I Question whether he could insert or no.

BUT if an early Attempt to do a thing be sufficient to prove the Antiquity of the Fact, you might have gone further back than *Blundevile* or *Mercator* either; for an Instance, for *Ptolomy*, which lived above 1500 Years ago, made an Essay towards a Globular Projection, and furnished it with Meridians and Parallels, which is all that I find done in *Blundevile's* (from *Mercator's* Direction) that you speak of; and yet, this is so far from derogating from the worth of the Globular Projection, as we now offer it to the World; that it adds very much to its Honour

Honour, that that very Projection, which alone can represent the Surface of the Globe in its true Appearance, and was upon that Account, thought worthy the Studies of such famous Men, so long ago, should now, (and not till now) be brought to that Perfection, to be rendered familiarly applicable to practical Navigation; which all must own to be an Improvement of the highest Rank; when upon this, all Distances can be truly measured by a Scale of equal Parts, which cannot be done upon any other Projection; and doubtless, these great Men, who thought it worth their Thought, to do what they did toward the Globular Projection, would have greedily embraced and encouraged this further Improvement, had it been propos'd in their Time, and have thought the Opposition of Self-interested Persons, below their Observation.

BUT since you have drawn us some Rumbs, it is no Matter, whether they are *Blundevill's*, or no; however, we will now come to your Remarks in Pag. 9 of your Letter; and I would ask you, if you did not blush for Shame, and your Hands tremble for Horror, when you were about to write such a palpable and concerted Falshood, as you there Charge upon me in those Words? *And since in the Instructions for the Use of the Globular Chart, we are directed to draw a Parallel, suppose to a N. E. by N. for a N. E. by N. 'tis plain, that this Globular Chart is false, &c.* and in the next Paragraph, you tell us, *the Curve F G, which you have drawn Parallel to the N. by E Curve F A, is a N. by E. Rumb, by the Directions I gave*; now Sir, what an untruth this is, I shall prove by my own Definition of a Rumb upon the Globular Projection, and the true one upon the Globe, which is the same as 1, I said the Rumbs are inclining Spirals, therefore Rumbs of the same Denomination cannot be parallel Spirals. — 2, Any Rumb makes equal Angles, with every Meridian it passes through, but ceaseth from being the same Rumb, if the Angles differ. How then can you say, that the Curve F G, is a N. by E. Rumb, when 1, it is Parallel to another N. by E. Rumb. 2, It makes not equal Angles with every Meridian it passes through, and therefore by Definition the first, it cannot be a N. by E. Rumb, nor by Definition the second, can it be any Rumb at all, *by the Direction I gave*, which to do the World and my self Justice, I shall here insert Verbatim, as they are in the printed Sheet.

IT is own'd, That the same Rumbs in different Parts of the Chart are not Parallel, as we prov'd before, but incline toward each other as they come nearer the Pole, and therefore it may be objected, That any Rumb describ'd Parallel to another, cannot be exact, which we allow; but although the Curvity of the Rumbs is so much, that it ought by all means to be regarded, yet their Inclination being but little in a distance of a 100 Leagues, may easily be accounted for by Judgment; but if you would still be more exact, you may describe your intermediate Rumb, by first drawing a Rumb parallel to the given Rumb on one side of the Point sail'd from, and then drawing it parallel to the same Rumb on the other Side of the Point sail'd from, and observe the difference between the 2 Curves, which by allowing proportionably, you will find where between them the true Rumb will fall; but this trouble is not necessary, for you may by the former Rules, [*viz.* allowing by Judgment] without this exactness, find the Rumb to less than half a quarter of a Point of the Compass, which is sufficiently exact in all Cases in common Practice.

HERE 1, I have asserted, that the same Rumb in different Parts of the Chart are not Parallel. 2, That in a short Distance where the Inclination is but little, it may

may be allow'd for by Judgment. 3, Where more exactness is required (as in greater Distances) the Rumb to be drawn, must not be Parallel to that on one Side of it, or the other, but *by allowing Proportionably, you will find where between them, the true Rumb will fall*: Now whatever I meant by [*Proportionably*] (which you pretend to be so puzzled at, and which I shall by and by explain) I appeal to all Artists, whether any unprejudiced Person could construe these Words in any Respect, to intimate that a Curve drawn parallel to a given Rumb, can be a Rumb of the same Denomination; (or indeed, any Rumb at all.) How then could you say, Pag. 9, that we are directed to draw a Parallel, suppose to a N. E. by N. for a N. E. by N. &c. and afterwards assert, that the Curve so drawn Parallel to a N. by E. Rumb, is a N. by E. Rumb, by the Directions I give: May not any Person wonder at your preverse Construction, of what I have published in that printed Sheet; in which, although it was adapted chiefly to that two Sheet Chart, to which it was annex'd, and in which, no material Error could be contracted, by following these more general Direction; yet, because we were then proceeding to make other Charts, which both approached nearer the Pole, and possess'd a much greater Quantity of the Surface of the Globe. I added a more particular Rule, for taking up an intermediate Rumb from a Point given; which doubtless, I should not have done, had I thought Parallels sufficient in any Case; nor could I possibly have given Directions to *allow by Judgment*; and again, to *allow Proportionably*, if I had intended to be understood, that Rumbs of the same Denomination are Parallel to one another; that is a plain Proof of your Disingenuity in drawing yours, which is contrary to the Definition of a Rumb, or of inclining Spirals, as I have said our Rumbs are; tho' allowing *by Judgment* might be sufficient in such Cases as I there mentioned comprized in that Chart; where the Meridian did incline but little, in such a small Space as 100 Leagues; and that was what I meant, as is evident by my giving more particular Directions for Cases that required it; and that you have seen these Directions is also evident, because you make that, the Subject of the next Civil.

HERE, I suppose as you do, that ab and cd are two N. N. E. Rumbs, and I am describe a N. N. E. Rumb from the Point E , draw EG parallel to cd , and EF parallel to ab , so far you are willing to understand right; but here Sir, you give us an eminent Instance of your premediated Partiality: In the Chart you have drawn a Curve parallel to a N. by E. Rumb, and at above 200 Leagues Distance from it, and assert it to be a N. by E. Rumb, *according to the Directions I gave*; and yet in your Explanation of the Figure in Pag. 10, you observe, that having drawn the parallel Curves, you there mention; I tell you, *we must observe the Difference between them, and by allowing Proportionably, we shall find, where between them the true Rumb will fall*. Now, Sir, if that Parallel Curve could likewise be a N. by E. Rumb, or was so designed by me; pray, What Occasion could there be for the proportional Allowance that you own I mentioned, and by which you in express Terms contradict your self? But since the Word proportionably seems so much to puzzle you, I shall explain it; but in the mean Time tell you, that whatever be the strict meaning and design of the Word, it can mean no other than some Sort of Inclination of Rumbs of the same Denomination as I first asserted in my Definition of Rumbs, which proves plainly, that it is a meer malicious Fiction of your own, to say that FG parallel to N. by E. Rumb could be a N. by E. Rumb *by the Direction I give*, when in the very next Page you say, (and that

that truly) that I tell you to allow Proportionably, &c. except you can prove that Parallels incline *proportionably*, which would be absurd.

BUT to explain my Sense of the Word *Proportionably*, know that if a Point is assumed Equally Distant in a Parallel from two Rumbs already drawn, the Rumb drawn through that Point must be continued Equidistant from the same Rumbs, in all the Parallels through which the three are continued; or if the Point is two-thirds, or nine-tenths, &c. from one Rumb already drawn to another; the Rumb to be drawn through that Point, shall be continued at two Thirds, or nine Tenths, &c. of the Distance between the said Rumbs; and this I call allowing Proportionably, and what I dare say, you will allow to be the most simple and genuine Sense of the Word you seem so much puzzled at.

I suppose you will not have the Assurance to deny the Truth of this Proportionality in Theory; but as your unwearied Endeavours are bestow'd in cavilling at and opposing what you cannot imitate, I suppose your next Objection will be, that it is difficult in Practice, *viz.* that in taking up a Rumb from an intermediate Point, this *proportionable* Allowance will be hard to be determin'd; and this I have more Reason to foresee, because you so pervert the Directions I have given, as I observe from your Remarks upon the Scheme, in Page 10, where having (agreeable to my Directions) drawn from the given Point *E* the Curve *EG* parallel to *cd*, and *EF* parallel to *ab*, then you scoffingly say, *Must I describe with my Hand by Guess the Curve EK that shall lie in the Middle between EG and EF?* Here you verifie the old Proverb, *There is none so blind as those that will not see*, or else it is a plain Proof of the Reality of what I before but mention'd in Jest, *viz.* that you do not understand the Meaning of the Word *Proportional*; for if the bare Eye may easily perceive that the Point *E* is more than nine Tenths of the Distance from *cd* towards *ab*, and yet you draw *EK* to lie in the Middle between *EG* and *EF*, pray, Sir, where is the Proportion or Equality between one Half and nine Tenths: But yet supposing the Point *E* is nine Tenths of the Distance from *cd* to *ab*, then the Curve *E* is a N. N. E. Rumb from *E* shall all along be carried at nine Tenths, the Distance from *EG* to *EF*, in all the Parallels through which they pass; and that is what I mean by allowing proportionally.

AND now from what hath been said (lest even this should be thought too troublesome an Operation to belong to a Projection so natural to the Eye, and intelligible to the Mind) we may deduce this plain and easy Method for taking up a Rumb from any given Point, which although I did not mention in the printed Sheet, nor designed to take Notice of it, till we publish'd the Whole, yet lest you should think I was beholden to you in this Case, I shall here insert it, it being more Expeditious and Mathematically true, and may be performed by the Help of only one Rumb of the same Denomination, with that to be drawn or described.

YOU may observe, that any two Rumbs of the same Denomination (suppose N. N. E.) crossing any Parallel of Latitude at whatsoever Difference of Longitude, they retain the same Difference of Longitude between them in every Parallel they pass through, as I shall hereafter demonstrate; yea though they cross the Equinoctial, and are continued in a contrary Latitude: And hence it will follow, that if a Point be given in any parallel of Latitude, and at any Distance from a Rumb
alrea-

already described, take but the Difference of Longitude between the Point and that Part of the Rumb that crosseth the Parallel, that the Point lies in; and setting off that Difference of Longitude in as many Parallels as you please (which may easily be done in our Charts where the Meridians and Parallels are described) gives the Points which the Rumb should pass through, tho' it perhaps need not be described, because it is attended with this Excellency, that you may find any Point in the Rumb that is required, without describing the Rumb, or finding any intermediate Point.——Now, Sir, if you did not know this before, perhaps this Information may be of Service to you: But if you did know, then look back and blush for Shame at your Curve *FG* in your pretended *Globular Chart*, which Curve you call a *N. by E. Rumb*, and yet some Part of it is not twenty Degrees of Longitude, and some more than fifty Degrees of Longitude from a *N. by E. Rumb* in the same Parallel, which is a plain Proof, that that very Rumb upon which you had your whole Dependance for proving the *Globular Projection* false by twenty in forty, was it self drawn wrong by more than thirty in fifty; (*here is stretching with a Witness*) which if you deny, I do hereby undertake to prove before any Mathematician you please to produce, and at any Time and Place you think fit to appoint, because it is below me, to imitate you in asserting what I cannot prove.

N O W, Sir, pray describe a *N. by E. Rumb* from your assumed Point *F*, with the Definitions of a Rumb that I have already mention'd; as, 1st, Let it incline towards that *N. by E. Rumb* already drawn; or if there was another on the other Side of the Point *F*, let it incline towards both *Proportionably*. 2^{ly}, Let it make equal Angles with every Meridian it passes through. 3^{ly}, Let it always keep the same Difference of Longitude from the *N. by E. Rumb* already drawn in every Parallel they pass through. If your Rumb have one of these two last Properties, it will have both; and if it have both the last, it will have the first. If you (I say) draw such a Rumb from *F*, try whether you can from thence prove our *Globular Projection* false by *twenty in forty*, as you promis'd to show; and for the Proof of which I suppose your Dependance was upon this Artifice only: Nay, I will not pervert the Sense of your Words as you have of mine; try if you can prove it false *two in forty*, as fairly as I have proved what most Books and Schoolmasters call Meridian Distance in the Question I propos'd to be false *one in six*, and I will gladly give you a Hearing; but when I have forgiven you *nine in ten*, if you cannot make out the odd one, you had better publish your Recantation, and let the World know, that you promis'd that in your Letter, which you were not able so much as to compound at the Rate of two Shillings in the Pound towards the Performance of, and that if the *industrious Mariner's Ship* should be run ashore upon the *fatal Place*, it is owing to your Malice or Ignorance, and not to any Deficiency in the *Globular Chart*.

I shall not now proceed in your Words, [*Thus having proved, &c.*] but shall appeal to your self, and also to all learned, but unprejudiced Persons, whether or no I have proved the 9 and 10 Pages of your Letter, to consist of a Complication of Prejudice and Falshood; and amongst this Class, I think, I ought to rank your Objection against these Words of ours, *The Projections are (like the Earth it self) truly Globular, with inclining Meridians, equidistant Parallels, &c. agreeing to all the Definitions of the Globe.* To which you Learnedly answer: *Now that a thing may be truly Globular, and agreeable to the Definitions of the Globe, it must have these Properties, viz. First Length, Breadth, and Thickness, &c.* A wise Objection from a

Learned Man! As if the Dimention of Thickness could be express'd upon a Superficies: If you say it can (and would prove ours Deficient for Want of it) you contradict one of the Definitions of the very first of *Euclide*; if you say it cannot, it is absurd in you to expect it, or to construe our Words that Way; and yet the Expression is as justifiable, as to say, I saw a Picture drawn to the Life, very like the Person it represented, and yet it hath neither Life nor the Dimention of Thickness, both which were to be found in the said Person; and any impartial Man would think it the Effect of Prejudice, if not of downright Infatuation, to say, A Picture is not drawn to the Life or in due Proportion (according to the common Acceptation of the Expression) because it wants Life and Thickness. But with another Argument or two, as absurd as that, and a little *Wapping* Rhetorick in Ridicule of the Word *Globe* and *Globular*, comparing them to Astrologers Schemes and uncouth Words and Phrases (a wonderful pretty Expression, to come from a Mathematical Schoolmaster, that pretends to understand the *Globe*) with this and the like Stuff, not to be expected from a Gentleman, you qualifie the Paragraph to be cast among the rest of your Railery, to make the Composition the stronger.

AS to what you say about a *Calculus*, I shall only answer you in your own Language, *page 3.* of your Letter; or at least to the same Purpose, the main Question that relates to our Chart and the *Calculus* I shall use, is, Whether it will by a ready Method bring out a true Answer, with Respect to Latitude, Longitude, Course, Distance, &c. And if the Result of that *Calculus* agree with the Projection, and be thereupon represented in its due Proportion, and measur'd by so simple an Instrument as a Scale of equal Parts (all which you shall find in the *Globular Charts*, without the least Deviation from what I have spoke or printed upon that Account) then (to conclude this Paragraph, as you conclude yours) 'Tis no Matter what's said by ignorant and partial Men.

IN *page 6.* of your Letter you say, I have offer'd at the Solution of the Problem [one Latitude Distance and Diff-Longitude given], you do not say, I have solved it; nor can you say, I have not but go on in your old detracting Vein that I prudently took no greater a Distance than Forty Leagues: And so you proceed, But let him suppose the Distance 800 or 1000 Leagues, and then try, if it can be done any more by his Chart, than by Numbers. To this I answer: — Yes, I can do it by Inspection upon the Chart, and you own you cannot do it at all by Numbers.

ALTHOUGH you own, that it has not been solved by any that you know of, yet it may easily be done upon the *Globular Projection* to 800, or 1000, or 1200 Leagues, only by Inspection, as you see performed in this Book, and that to as great Perfection as it is possible to set off a Data in Navigation upon a Sea-Chart, only with this Difference, that our Distances are something shorter than your Calculation by the *Rumb* brings out (if you invert the Question) as the Arch of a great Circle is shorter than the *Rumb*, which I reckon so far from being a Deficiency, that I think it an Excellency far exceeding that upon which you so highly value *Mertator* in your *page 14*, because the Great Circle now falls naturally in our Way, though it was before acquir'd by tedious Calculation, but was always allow'd to be the nearest Way: And here again you cannot forbear to season your Discourse with a palpable Untruth, in *page 6*, where you say, *We pretend*

pretend there are some Cases impracticable upon Mercator's Chart, when there is but one; but if you read of that one in Mr. Colson's Calendar, you might there read of another, viz. one Latitude, Departure, and Difference of Longitude given, and that together with that you have mention'd, make more than one, as sure as one and one make two.

BUT having upon this Occasion your Page 14 and 15 open before me, I cannot forbear making some Remarks, tho' perhaps you may call it a Digression, but if you do, Digressions are not always unseasonable.

YOU say Page 14, *How excellent then is this Property, and how much does it enhance the Value of the Mercator's Chart, that it has no Lines in it, expressing this uncertain Thing (viz. Departure or Meridian Distance), and yet in the very next Page, where you suppose both Latitudes and Course given, you make Use of that uncertain Thing (the Departure) to find the Difference of Longitude, which being done, you say, the Difference of Longitude so produc'd, is true, and yet the Departure from whence it was deduc'd by a common receiv'd Proportion, is false. Here you exceed all History, and work two Miracles at once, First in producing a true *Questita* from a false *Data*, and Secondly in endeavouring to prove (and that with an Admiration) that the Value of the Mercator's Chart is much enhanc'd, because upon it there can be no Lines expressing the Departure, and yet by Departure such a material thing as Longitude may be found; nay, which is more admirable, the true Longitude may be found by a false Departure, which you only barely assert, and leave the Reader in a Fog, without so much as attempting to solve the Paradox; which to help you out, and prevent People's being imposed upon, I shall do for you in a Page or two further. But now, Sir, to come a little close to the Matter, if a false Departure bring out a true Longitude, what will a true Departure do, if that bring out a true Longitude too, then false and true are all one; but if not, and if the false *Data* only can produce the true *Questita*, or at least if you give your self the Liberty to believe so, and would impose that Belief upon others, without any further Explanation of the Matter, I shall cease to wonder, that you prefer Falshood before Truth, which I apprehend has been the Drift of this Undertaking.*

PERHAPS you will endeavour to evade this Argument, by saying there are two Sorts of Departure, the one false, whereby you attain the Difference of Longitude; and the other true, which is the Ship's Distance (in a Parallel) from the Meridian departed from (and this I believe indeed to be the real Truth): But what! if you cannot express the false one in the Mercator's Chart, cannot you express the true one; neither which is only an Arch of a Parallel; or if express'd, will not both your Scales measure it? Indeed I think in this you depreciate very much from the Value of Mercator; or if you call it supporting it, it is like cutting off one of his own natural sound Legs, that you may have the Honour to fit a wooden one in its Place.

HOWEVER, you have in the whole Discourse, received all the Charge against Mercator, without any Defence, and now dropt all the seeming Contradictions in it, without reconciling them; but rather (as the easiest Way) thrown out the Departure, as in Pag. 14, because it is troublesome; and yet, at another Time

Pag. 15, make it one of your Data, because it is useful, and yet, both in Favour of the *Mercator's* Chart, and from that Medley you draw this Conclusion, Pag. 16.

HENCE we may discover, the folly of those who propose to construct a true Chart for a Voyage between two Places, from what they call the Departure, found in a *Mercator's* Question, and the true Difference of Latitude, between the Places taken as Data.

IT had been much more for the Honour of you, and the Cause you have undertaken; if you had given some more intelligible Reasons for these two Sorts of Departure, which may be thus done; suppose a Ship Sail N. E. in the Figure *abcd*, she cuts every Meridian at an Angle of 45, and so the infinite Meridians she passes through, are Bases to their respective Triangles, and those Bases in an Angle of 45, are equal to their Perpendiculars: Thus *ae* is equal to *ef*, and *fg* to *gb*, and *hi* to *ik*, and *km* to *mc*, and consequently the Sum of the Bases *ae*, *fg*, *hi*, and *km* are equal to the Sum of the Perpendiculars *ef*, *gb*, *ik*, and *mc*, and this is the Departure found by *Mercator*, and by which the true Difference of Longitude is found; but by Reason of the continual Inclination of the Meridians, which are the Bases of those Triangles, the Distance from the Meridian made by sailing from *a* to *c*, which is represented by the Line *dc*, is not so much as the Sum of the said Perpendiculars; but the Meridian Distance *ab* made by sailing from *c* to *a*, is more than the Sum of the said Perpendiculars, tho' the Ship sails the same Distance, and in the same Rumb. See Fig. 2.

COROLLARY.

HENCE, both these Sorts of Departure may be truly express'd and measur'd upon the *Mercator's* Chart. — 1, The Distance sailed being given or found, adjust a Scale, so as to contain a Number of equal Parts, equal to the given Distance, between the Point sail'd from, and the Point come to: Then the nearest Distance from the Ship, to the Meridian departed from, measured upon the same Scale, give truly that Departure, by which the Difference of Longitude is found, and is easily perform'd by a Sector, or by a Scale, like that which I publish'd in Practical Navigation some time ago, which you have now stuff'd into your Book to help to fill it up. — 2, The same nearest Distance from the Ship, to the Meridian departed from, measured upon the Scale for measuring Parallels, gives the true Distance (in Miles or Leagues) of the Ship, from the Meridian come from. — Again, 3, The same Distance of the Ship from the Meridian measured upon the Equinoctial, gives the Difference of Longitude. Thus you see both these Sorts of Departure, may be measured upon the *Mercator's* Chart, (tho' you have said the contrary;) Ergo, they may be express'd, and as you are a Volunteer in *Mercator's* Cause, I cannot think your derogating from his Honour, can be the Effect of Malice or Design; but shall rather have so much Charity for you, as to impute it to your Ignorance, and conclude that you would not have done it so much wrong, if you had understood it better.

BUT you have quite dropt Departure out of your Data (at least, in constructing the *Mercator's* Chart) and all, I suppose, because you can find no Way to reconcile Departure to the Globe, upon a right lin'd Projection; but please to take Notice, Sir, that as Departure is always an Arch of a Parallel, if you please to apply

apply your self to the Globular Projection, you may there Measure any Arch of a Parallel in Miles, by a Scale of equal Parts or in Degrees of Longitude, by the Divisions of that Parallel; and here all your Difficulties which fill up more than two of your Pages are reconciled at once, which I humbly conceive; cannot be done any other Way; for if the *Mercator's* Chart will not admit of it, I conclude, the Plain Chart will not; and if these Difficulties could be reconciled upon the *Mercator's* Chart, it would have been such a material Argument in its Favour, that I assure my self, you would not have dropt it; but if they cannot, I can no way believe that the *Mercator's* Chart can be any better for that Deficiency: If it be no Deficiency, but an excellent Property, as you say Page 14, then let me ask you, is the Departure of no Use in Navigation? If you say No, why do you make it one of your Data in such a material Proposition as that of finding the Longitude? If you say it is of Use, it cannot be an Excellency, that it cannot be express'd, but would rather be an Excellency, if that useful Thing amongst the rest could be express'd: However, I conclude with you, that it cannot be express'd in the *Mercator's* Chart, so as to be truly measur'd by a Scale of the same equal Parts, and my Reason is, that in all oblique Courses (*viz.* all but upon a Meridian or a Parallel) the Departure is the same in the Course and in the Reverse Example in the foremention'd Problem, A Ship sails N. E. from Lat. 60 North, to Lat. 70 North, and sailing back S. W. from Lat. 70 to Lat. 60, the Meridian Distance is the same in both, according to the common Operations in *Mercator*, *viz.* 600; but in the former, *viz.* sailing N. E. from Lat. 60 to 70, the true Meridian Distance is but 492, and in the other it is about 720, and in all other Cases it is universally so, that sailing towards either Pole or encreasing your Latitude the true Distance of the Ship from the Meridian, is always less than that found by Calculation, according to *Mercator*; but sailing towards the Equinoctial, or Decreasing your Latitude, the true Meridian Distance is more than that found by Calculation; and hence it was, that your true Departure was more than that found by Calculation, when you sail'd to the Southward in North Latitude; and this cannot be accounted for any way but by allowing for the Curvity or Inclination of the Rumbs which at once solves all the Difficulty, but cannot be express'd upon a right-lined Projection: And that is the real Reason, why Departure cannot be truly express'd in *Mercator*, and not because it is better without it: But I suppose you have read the Fable in *Aesop* of the Fox and the Grapes, and shall leave the Application to your self.

NOW, Sir, the Globular Projection readily reconciles these seeming Differences and Difficulties about Departure, as I have shewn already, the Meridian Distance being truly express'd there upon, as well as Longitude, which tho' both may be the same Arch of the same Parallel, yet measur'd by a Scale of Equal Parts of Miles or Leagues, it is Departure or Meridian Distance; but measur'd in Degrees and Minutes, it is Longitude in Degrees and Minutes, without finding what you call a false Departure, preparatory to the Longitude, which no other Projection can, in both Respects, be capable of, without forming various Scales for the Performance thereof.

NOW methinks, when you had made that wonderful and observable Discovery, page 12, That the *Mercator's* Chart bath no such Thing, as is commonly signified by the Word Departure or Meridian Distance; and in pag. 14 cry out with Admiration, how much that Deficiency enhanceth the Value of the *Mercator's* Chart, I cannot

cannot forbear to tell you, that if Departure had been of no Use, the Chart could not be the worse, if it might be express'd, but if it is of any Use, it must be a Deficiency more or less, if it cannot be express'd, and that in Proportion to the Value of the thing so omitted.

SURELY then, you ought rather to have said, The *Mercator's* Chart is an excellent Invention for expressing the Course, Distance, Latitudes, Longitudes, or whatever is expressible by Right Lines, or reducible thereunto; only the Meridian Distance cannot be thereon described true in all Respects, because limited by Curve Lines, which are peculiar to the Globular Projection only, and you might have said the same of the Great Circle, which I suppose you were sensible of, because you have not so much as mentioned it in your Treatise of the Description and Use of the *Mercator's* Chart, upon which, if the Great Circle could have been represented any thing like it self, I suppose you would have told us, or else you had been deficient in shewing the Use of a thing, and yet leave out so material a Point, which has hitherto been attain'd by laborious Calculation; but is upon the Globular Chart, represented in so simple a form as a Right Line, and traced out by Inspection only.

HOW excellent then are these properties, and how much do they enhance the Value of the Globular Charts; that it has Lines to express, not only Latitudes, Longitudes, Rumbs, Distances, &c. But also the Departures and Arches of the great Circle; and is also capable of expressing the true Shape and Situation of Lands, Coasts, &c. In their true Symmetry and Proportion of Magnitude, with Respect to one another.

BUT there are some Objections which you have made, and some that you have not made; which I shall take this Opportunity to Answer, to stop the Mouth of Opposers, and prove the Globular Projection easy and practically true.

ONE Objection of yours is, That we cannot make a Chart of any Part of the World, tho' never so small, when some of that Part lies in North, and some in South Latitude; &c.

ANSWER, I have already made one for both Latitudes North and South, and between 70 and 80 of Longitude, including both the Coasts, viz. that of *Africa* and of *America*; upon this I measured from Lat. 14 North, to 14 South, and 72 Degrees of Longitude, and by impartial measuring, it contained in that Space 1531 Leagues, of 1532; a League in Point of Measure in such a Space being scarcely perceptible and although this is the chief Case in which the Projection is strained; yet, the Error in practice is so inconsiderable, as not to amount to one League in 1500, and may by you be thought tolerable in Theory, because therein the Terraqueous Globe is not transformed, or suppos'd to be transformed into any other Geometrical Body, than what it really is.

IF you are not from hence satisfied, as to the Truth of the Performance, you may calculate it at your Leisure; and if you find it right, you must allow Matter of Fact to be the best Testimony of the possibility of any Performance, whatever seeming Difficulties may be urged by those that are ignorant of, or prejudiced against so useful a Design.

A NO.

ANOTHER Objection might be the Difficulty off setting of a true Distance upon a curving Rumb, a Chord being always shorter than the Curve or Arch.

I Answer, that near the Equinoctial, the Rumbs Curve insensibly, or differ very little from right Lines, and when they Curve more, any tollerable Care may prevent contracting any sensible Error; as for Instance, in so high a Latitude as 74, and in the Parallel, or East and West Rumb (if it be proper to call it a Rumb) which Curves more than any other Rumb in the same Latitude; yet, in so great a Distance as 300 Miles, the right Line differs not above one Mile from the Distance in the Rumb or Curve which is a meer Trifle, and not worth the Name of an Objection, except amongst Persons who would be glad to Muster up any Thing that looks like one.

A S to the difficulty of taking up a Rumb from any given Point, I think, I have answer'd that Scruple already; Rumbs of the same Denomination, keeping at an equal Difference of Longitude, in every Parallel they pass through, which should it be denied, I am ready to Demonstrate thus: Suppose there was at every Degree of Longitude in the Equinoctial a N.N.E. Rumb, drawn, viz. 360 in all, and they were continued through the Parallel of 70, they must intersect the said Parallel, either at equal or unequal Distances: If they divide the Parallel unequally, then some N. N. E. Rumbs, make Angles with the Meridian, different from other N. N. E. Rumbs which is absurd: But if they divide the Parallel equally, viz. into 360 equal Parts, then each Part is a Degree of Longitude; therefore they retain the same difference of Longitude in each Parallel which was to be proved; and consequently, taking up a Rumb, or finding the Points that any Rumb shall pass through from a given Point, is rendered easy and exact, which has always been suppos'd to merit the Name of a grand Objection; but is now quite remov'd.

NOW Sir, if *First* Latitudes, *Secondly* Longitudes, *Thirdly* Courses, *Fourthly* Distances can be discovered and set off upon the Globular Projection, and that to sufficient Exactness; you cannot deny its being equal to any other for Practice in all Cases. Now give me leave to shew wherein it exceeds; as *First*, In representing the Surface of the Globe in its true Form and Proportion, without a Necessity of any Artifice for measuring it; but a Scale of equal Parts.

Secondly, BY its being capable of expressing the true Meridian Distance, only by the same easy Method of Measuring, which you assert *Mercator* is not capable of.

Thirdly, **FOR** that, thereon the Arch of a great Circle may be laid down in its proper Form, viz. by a right Line, tho' amongst the rest of your Criticisms, you may say, it is impossible to describe a right Line upon the convexity of a Globe; yet I answer, that as an Arch of a great Circle is the nearest Distance that can be described upon the Surface of the Globe; so a right Line is the nearest Distance that can be described between two Points upon a Plain; therefore a right Line is the nearest Representation of an Arch of a great Circle; that it is possible to describe upon any plain Projection; *Esge*, That must be the truest Projection that represents it so, or if you deny it, I would only ask you what can be a truer Way of representing Things, than like what they are.

AND

AND now, Sir, I think, I have answer'd all that was material in your Letter (if any Thing in it could be said to be material) as that it will not cause an Error of one Mile in 300 in Distance, in that Navigable Part of the World, where it is most liable to Error, and less or none, where the Rumbs come nearer to right Lines, nor one quarter of a Degree Error in the Rumb, tho' taken up from a given Point. If the Rules I have here mention'd be practis'd, because Mathematically and Demonstrably true, and if it was not, yet if it is practically so, or that it was not liable to any Error that might hinder the very End and Design of Navigation; its natural Truth in Appearance and Simplicity, in Use and Practice, would be sufficient to engage the good Opinion of competent Judges in its Favour; but those that *Momus* like, make it their Business to find fault with other Mens Performances, may as well find fault with Decimal Arithmetick, because we cannot thereby express that small Fraction, one Thirds, or two Thirds, or (to use Terms of Navigation) you cannot express one Mile, or two Miles in Decimals, a League being the Integer, or with the Rules for extracting the Square-Root, because they do not furnish us with Directions for extracting the Root of 3 or 7, or any other surd Number: Nay, such Criticks do no less than vilify the indefatigable Industry of my Lord *Nepair*, Mr. *Briggs*, Mr. *Gunter*, &c. in the Invention, Application, and Improvement of Logarithms, which though universally received for Expedition, and sufficient Exactness; yet, by your Argument, must not be trusted to in Navigation, Astronomy, &c. because we are generally contented with the nearest Number answering to the Logarithm found, the Calculation of the exact Fraction being very troublesome; from whence, I Question not, had you lived in the Infancy of that useful Invention, you would have exerted your Talent, in opposing that as much as you now oppose us.

NOW, Sir, one Word of Remark upon your Treatise of Navigation, in which you give the Learner such Advice about the Choice of a Master, as you ought to be commended for: For recommending Persons to a Master of such Qualifications as Center in your self is; but saying in other Words, *come and learn with me*, and as you wisely, and I suppose, Experimentally observe *the best Way to secure ones self, is to get rid of a formidable Enemy*; and you perhaps, apprehensive what Detriment you might receive in what you profess by the Approach of a true Globular Projection, so well recommended, powerfully authorized, and liberally encouraged, you might prudently foresee (like those that made Silver Shrines for *Diana*) that if this is encouraged, it might be a Hindrance to your Gain; and therefore, I suppose, it is that you stickle so much against it, and I am not surprized to see it so, for seldom any Thing new and valuable comes into the World; but it meets with Opposition from Persons in a contrary Interest, whose Efforts are commonly Proportionable to their Apprehensions of the real Excellency of the Subject so oppos'd: But here you bewray your Vanity, in condemning the Authority that warranted, the Judgment and Learning that approved, and the Generosity that encourageth this useful Work, as if a Scene of Insatiation had seized all Mankind, only you and Mr. *Collier*, had the Fore-sight to escape it.

AND here, Sir, as you assume such a Privilege as calling People to Account for exercising their own Authority; believing their own Judgment, and disposing of their own Money, pray let us know what you are, how recommended and what you have done that exceeds what you condemn.

YOU

YOU usher your Book into the World under the Sanction of *Thomas Hafelden*, late Teacher of the Mathematicks to his Majesty's Volunteers in the Navy. Pray, Sir, what have you done in the almost 20 Years you were abroad? Have you made any Draughts of Harbours, or taken the Sounding, going in, or coming out? Have you brought us the Draughts of any Coast that exceeds what has been done before? If you have, why did not you first give them to Mr. Mount, before you went a-begging to other People for Supplies of that Kind: Had you never been abroad, you had been excusable.

AGAIN, have you determin'd the Longitude of any Head-Lands abroad by Eclipses of the Moon, or otherwise? Or have you taken Pains to get a Collection of Observations of the Variation of the Compass, which may contribute to the adjusting the Difficulties yet depending therein? If you have, be so kind as communicate them to Dr. Halley, who will accept them much more generously and thankfully too, than your *Billingsgate* Railery, to which a Gentleman of his Character must be a meer Stranger.

AGAIN, what have you done since you came home? Have you ever appear'd in Print upon any Subject, and managed it so well as to be of Service to the Publick. Indeed you may safely say, that after near 20 Years Experience abroad, and some time at Home, you have at last been qualified to write a Volumn of Detraction in Quarto, with a useful Appendix, containing a Discovery of what has been known to almost every School-Boy this hundred Years. I suppose, Sir, you have read the Fable in *Aesop* about the Mountains bringing forth.

AS for your trifling Stuff about the Construction of the *Mercator's Chart*, and of the Scale which I put in *Practical Navigation* four or five Years ago, and your Propositions for the Use of the said Chart being all such poor common Matter, that I cannot think it worth a Treatise, much less fit to be inscribed or introduced to the Learned Dr. Halley. In short, Sir, the whole is such dull Ware, that I cannot forbear to think that you had something else at Heart when you did it; and the plain Truth is, I am of Opinion, that you had no Intent to serve the World, only you had a Letter to introduce, too scurrilous to bear its own Title and the Name of a School-master, both in one Page; and therefore the better to colour your Design, you form a specious Pretence of publishing a Book, and tickle the Ears of the Ignorant with a few Trifles about the *Mercator's Chart*, and take that Opportunity to usher your scandalous Letter into the World, by screening it under the Protection of the *Description and Use of that most Excellent Invention, commonly call'd the Mercator's Chart, &c.* And my Reasons for this my Opinion are, First, I think, if you had had the Improvement of *Mercator* chiefly at Heart, you would have handled the Subject to much better Purpose: For what Service could you think to do the World, by publishing a few common Things known almost to every School-boy. My Second Reason is, because your Letter bears (proportionally) a much greater Share in the Book, than in the Title, which seems to me a plain Proof, that you had something to obtrude, that you were ashamed that People should see the Name of, till they had it in Possession, as the Rarée Show People do with their out-landish Creatures, keep them cover'd up, till People have paid their Money, and then taking off the Cloak, something appears enough to affright a Man out of his Senses.

D

BUT

BUT to draw towards a Conclusion, if the Writing this Book of yours was a voluntary Undertaking, pray make a Reflection: Or, if you were employ'd to do it; suppose your Master should ask you of your Success, what would you say? On the one Side, have you set *Mercator* in a clearer Light than it was before? Have you reconcil'd any seeming Inconsistancies, or rendered any thing easy and practicable that was difficult before? Have you defended it from any Charge brought against it? Nay, have you done any Thing at all to purpose for it? If not, you have only acted the Part of an unskillful Engineer; who by making a bustle about propping up a strong House, only increases Peoples Suspicion of its danger of falling. — Again, what have you done against the Globular Projection? Have you proved it false, either in Distance, Latitude, Longitude, Departure, or in the Arch of a great Circle? Have you proved it difficult, either in Theory or Practice? Or can you deny what I have said concerning it? If you have done none of these, you will only confirm People in their good Opinion of it; for those that take you to be an Artist, must think your Arguments to be groundless, where your Attempts prove abortive; and those that take you to be none, will not regard what you say, though never so full of Calumny: But if you think you have done any Thing to Purpose on one Side or the other, let us have it in your next Treatise, in which either let us have Matter more useful, and to the Purpose: Or else, let it be introduced by a Letter to some Person of a less eminent Character, than the celebrated Doctor *Edmund Halley*.

I might have made some Remarks upon your Scale; but shall only observe, that after you have spent your Introduction, and your whole Treatise too; in undervaluing and exposing those pretended Difficulties, that you would make the World believe attends the Globular Chart, or any other Curve-lined Projection. You fall on directly in your Postscript, to give us a Description of a Curve-lined Scale, a Scale from that Construction, that you have all along been condemning, which (I Question not,) will puzzle all your Wit, to make it as intelligible as the Globular Projection; but we shall know better, what a Piece of Work you will make of it, when the *Proprietor* of the *Mercator's* Chart, shall think fit to have it inserted therein. Indeed, as *Mr. Wright*, the Inventor is Dead, I did not know that the Property of the *Mercator's* Chart had devolved upon any single Person, when the Author did not bequeath it by Legacy, nor the Crown confirm it by Letters Patent; but be that how it will, I would not have you affright your self with Apprehensions of any Body's putting your Scale in another Dress, and calling it their own; for I do not believe any will be so fond of it, as to go about to Steal it from you; but if you would have an easy, plain, and practical Scale to the *Mercator's* Chart, look in the Book called *Practical Navigation*, Printed for *Mr. Mount*, in the Year 1717, which Book (amongst many others) I corrected and improved as now they are, and for which, he honourably gratified me; and of which, the learned World have now the Opportunity of being Judges; and I willingly Appeal to *Mr. Mount*, whether any Deficiencies, (except Typographical ones, and but few of them) can be laid to my Charge: As the World must allow *Mr. Mount*, was well satisfied of, by his recommending me to the Right Honourable Sir *George Byng* (now Lord Viscount *Torrington*) to serve in Quality of Mathematician, Aboard of his Majesties Ship the *Barfleur*; and I hope, I may without Vanity say, that my Conduct and Performance there, is sufficiently attested by the Character, that his Lordship was pleased to give me since his coming Home; writ by

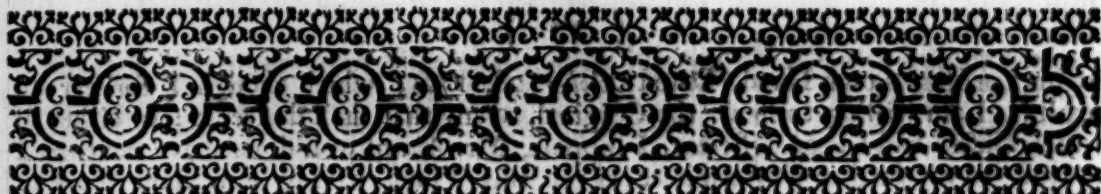
by his Lordship's own Hand, Dated *October 28, 1721*, which though I forbear to publish, I am willing to shew the Original to any that shall desire it; in either of which Cases, had I been deficient, I suppose, Mr. Mount would not have continued to trust to my further Performance as at this Time, having now some Work of Consequence of his in the Press, under my Inspection. From hence, (and the Encouragement given by other Eminent Navigators in the *Barfleur*, that subscribed for the Globular Atlas (of which the Captain was one;) and others of my publick Performances; the impartial World may observe how far your Aspersions may be look'd upon, below the Observation of,

(SIR,)

*A Lover of Improvements in Mathematicks;
especially, in that Noble and Useful Part,
called Navigation,*

HENRY WILSON.





The U S E

OF THE

GLOBULAR CHART.



HERE need not be much Time spent in the Description of this Chart, the Lines thereon being the same as in *Plain* and *Mercator's* Chart, viz. Meridian, Parallels, and Rumbs; but with this Difference in the Form of them; for whereas the Rumbs, &c. are all Right Lines in *Plain* and *Mercator's* Charts, and in *Mercator* the Meridians are Parallel to each other, and the Parallels at unequal Distances. In this the Meridians incline the Parallels are Equidistant, and the Rumbs are inclining Spirals or Curve-Line, being in all these and other Respects like the Surface of the Globe, and hence it is most properly call'd the Globular Projection, whose Use (tho' easily understood) we shall explain in the following Problems of Navigation.

P R O B. I.

To find the Latitude of any Place.

IF the Place propos'd lie in one of the described Parallels, the Figure at the Middle or End thereof shews the Latitude.

Example. I find *Cape de Geer* on the Coast of *Africa*, lies in a described Parallel, at the End of which is placed 30, which shews that *Cape de Geer* is in 30 Degrees, 00 Min. of Latitude North.

BUT if as it commonly happens the Place propos'd lie between two described Parallels, as suppose *Cape Finister*, and I would know its Latitude. Set one Foot of your Compasses in the next Parallel, whether above or below, it matters not, and extend the other to *Cape Finister*; with that Extent and one Foot in the same Paral-

Parallel, where it crosses the Graduated Meridian, extending the other the same Way as you did, the moveable Point will fall upon the Latitude, thus *Cape Finister* will be found to be in Lat. 43. 6.

P R O B. II.

To set off any given Degrees of Longitude upon any Parallel; Example to set 8 Degrees of Longitude East upon the Parallel of Tinmouth.

THE Meridian in this Chart being drawn but to every 5 Degrees, set one Foot of the Compasses in the third Degree at *e*, extending the other along the Parallel to the next Meridian but one, at *r*, which 3 Deg. and 5 make 8; set that Extent from *Tinmouth* Eastwards it will reach to *m*, which is 8 Deg. of Longitude from *Tinmouth*, &c.

IF it be objected that in Places that lie two Degrees or more from any Parallel, it will be difficult to set off a given Longitude exactly. I answer, that altho' this Specimen is but to a small Scale, and cannot conveniently be graduated to less than every 5 Degrees, yet the Charts themselves will be graduated to every Degree, or every two at least, so that no Place can lie above a Degree, and some not above half a Degree from a graduated Parallel, and thereby that Difficulty is quite removed, the Graduations of the Parallels altering insensibly in one Degree of Latit.

P R O B. III.

How to take up a given Rumb from a given Point, suppose a North by E. Rumb from the Point F.

FIND by Prob. 2. the Difference of Longitude, between the Point *F*, and the Point *N*, where the nearest North-by-East-Rumb passeth through the Parallel or Latitude of *F*, which Diff-Longitude you will find to be 16 Deg. 25 Min. take 16 Deg. 25 Min. of Longitude in the Parallel of 25, and set from *a* the Point of Intersection of the North-by-East-Rumb, and Parallel of 45 to the other Point *a* in the same Parallel; also take 16 D. 25 M. of Longitude in the Parallel of 50, and set from *b* to *b* in the Parallel of 50; and so by setting the said Longitude of 16 Deg. 25 M. in each respective Parallel, from where the Rumb crosseth it, you find the Points *a b o c d e f*, through which the Rumb is to pass, which whether it be described or not, is not material, the Rumb being by the Letters only so plainly represented; and this Method of taking up a Rumb, is attended with this Excellency, that if it is requir'd to know where the Rumb cuts any particular Parallel, you may by this Means find the Point of Intersection without describing the Rumb, or finding any intermediate Point: As suppose I desire to know where a N. by E. Rumb drawn from *F*, would cut the Parallel of 70, take from the Parallel of 70 the given Longitude 16 D. 25 M. and set one Foot in the Point *e*, where the N. by E. Rumb already drawn cuts the Parallel of 70, the other Point will extend to *e*, the Point where a N. by E. Rumb from *F* will cut the same Parallel of 70. And although we we have in our Globular Charts taken Care to put a competent Number of Centers

ters of Rumbs, yet lest this should have the Colour of a Difficulty, any Rumb may hereby be readily supplied, or any Point thereof found if requir'd without any Dependence upon the intermediate Part thereof.

NOW to apply this to Practice, a Ship at *A* in Latitude 50 North, and Longitude 5 Deg. West from *London*, is requir'd to sail S. W. but there being no Center of Rumbs at the Place I sail from, I must take up a S. W. Rumb. I take in the Parallel of 50, the Longitude from the Point *A* to the Point where the nearest S. W. Rumb cuts that Parallel, as at *g*, that Extent I find by *Prob. 2.* to contain 19 Deg. of Longitude; set therefore 19 of Longitude severally off every Parallel from the Point where the S. W. Rumb crosses it, it finds the Points *r* *f* *t*, through which the said S. W. Rumb passeth. Now suppose a Ship is to sail from the aforesaid Point *A* South-West into Lat. 35, and her Difference of Longitude is required. Extend your Compasses from the Point *t*, where the Ship is, along the same Parallel to *u*, (the Intersection of the Meridian departed from, and the Parallel of 35) that Extent will be found by *Prob. 2.* to contain 20 Deg. 31 Minutes, altho' one Min. in this small Scale is not to be perceived.

I have omitted the Canon for the Difference of Longitude, because (the Course being South-West) the Difference of Longitude is equal to the Meridional Difference of Latitude.

AGAIN, suppose the Meridian Distance is required, The Extent from *t* to *u*, measur'd upon the Common Scale of equal Parts in 336 Leagues.

P R O O F.

As Rad,	_____	_____	_____	10.00000
To Sine Comp. 35	0. _____	_____	_____	9.91336
So Diff. Long. 20 31 or 1231 Min.	_____	_____	_____	3.09025
To Meridian Dist. 1008 Miles, 336 Leagues				3.00361

HERE the true Meridian Distance is more than that found by *Mercator*, by 108 Miles.

THE Extent *A t* measur'd upon the Scale is 424 Leagues and one Third, the Distance in the Arch which differs insensibly from that in the Rumb in so small a Space.

P R O O F.

As Sine Comp.	_____	_____	_____	45—0—9.84948
To Diff. Lat.	_____	_____	_____	900—2.95424
So Rad.	_____	_____	_____	10.00000
To Distance 1273 Miles, or 424 Leagues and one Third				3.10476

P R O B.

P R O B. IV.

Both Latitudes and Difference of Longitude given, to find the Distance in the Arch, and also the Rumb.

WE shall Instance in Mr. *Hafelden's* Question of two Places *F* and *G*; but here, like the rest of his Book, he has patched up a few self Contradictions. He says (Pag. 9. of his Letter), that the Difference of Longitude between *F* and *G*, is suppos'd 60 Deg. 30 Min.; but it will require some of his Art of stretching and distorting, to make them appear 60 or 59 either, as he has placed them upon his Chart: However, we shall take that from whence it comes; but to come as near to him as truth will permit. I likewise suppose two Places, *F* in Lat. 39 29 North, and *G* in Lat. 75 00 North, and Long. East from *F*, 57 Deg. 40 Deg. to find the Bearing and the Distance in the Arch.

FOR the Rumb it is easily perceiv'd by the bare Eye, that *G* bears from *F*, between N. E. and N. E. by N. and you will readily find by *Prob. 3*, that a N. E. by N. Rumb, will cut the Parallel of 75, in the Point *w*, and a N. E. Rumb cuts it in the Point *x*; therefore without drawing the said Rumbs, it is easy to perceive that *G* bears from *F*, N. E. more than half a Point Northerly, and the Distance *F. G.* on the right Line *F G*, is the Distance in the Arch 877 Leagues if measured upon the Scale of equal Parts. The Course is North 38 15 East, or N. E. 6 45 Northerly; and the Distance in the Rumb 904 Leagues, which is more than that in the Arch, by 27 Leagues; the truth of all which is evident by the following Calculation by the *versed Sine*, according to the Directions in *Dr. Halley's Mathematical Tables*.

Sine Comp. of Lat. 75	_____	_____	_____	_____	941299
Sine Comp. of Lat. 39 29	_____	_____	_____	_____	988751
Sine half Diff. Longit. 28 50	_____	_____	_____	_____	968328
			Again,	_____	968328

38.66706

Natural Sine belonging to the Log. Sine 866706, is _____ 465253

That doubled _____ 930506
 Versed Sine of Diff. of the Sides 35 31 : _____ 1860534

Sum is the versed Sine of 43 52 _____ 2791040

This 43 Deg. 52 Min. is the Distance in the Arch of a great Circle, between the Places proposed, which reduced to Leagues is 877, as below.

43 52
 20
 877

BUT

BUT perhaps Mr. *Hafelden's* Master-puzzle, (with which I suppose he thinks he has crown'd his Work, and nail'd me down, and thereby merited the applause of his Admirers) is express'd in these Words: *Our Author has offer'd at the Solution of this Problem by the Globular Chart*, (meaning one Latitude Distance and Difference of Longitude, given in Page 6 of his Letter) *and for his Example, has prudently taken no greater a Distance than 40 Leagues; but let him suppose a Distance of 800 or 1000 Leagues, and then try if it can be done any more by his Chart, than by Numbers.* Here Mr. *Hafelden* has spoke to the purpose, and shew'd how much he encourages Improvements in Navigation, in desiring me to take a Distance of 800, or 1000 Leagues in a Chart, which taken even Diagonally, does not contain quite 600: Here I must either Stretch my Chart 200 or 400 Leagues, or assume a Distance that I could not express; which if I had done, I think, I had indeed deserved the Censure of wiser Men, than any I have yet found opposing me; but to let the World see that we can express a Space of 1200 Leagues, as well as 40, I shall prove by.

P R O B. V.

Both Latitude and Course given to find the rest.

A Ship at *B*, in Latitude 30 North, Sails N. E. into Latitude 75 North; I desire (only by measuring) to find the Difference of Longitude, the Distance in the Rumb, the Distance in the Arch, and the true Meridian Distance.

FIRST, by *Prob. 3*, draw the N. E. Rumb *B G*, to cut the Parallel of 70 in *G*, then is *G* the Place the Ship is in. The Curve Rumb *B G*, measured by the Scale at the Bottom contains 1273 Leagues, the Distance in the Rumb. The prick'd right Line *B G*, measured by the same Scale, is 1195 Leagues, the Distance in the Arch of a great Circle. The Arch of the Parallel of 75 comprehended between *G* and *B*, measured by *Prob. 2*, gives the Diff-Longitude 84 43, and the same Arch measured by the Scale of equal Parts, gives the true Meridian Distance 439 Leagues.

P R O O F.

1, For the Distance in the Rumb.

As Sine Comp. Course, 45 0	— — — — —	9.84948
To Diff. Lat. 2700	— — — — —	3.43136
So Rad.	— — — — —	10.00000
To the Distance in the Rumb, 3818	— — — — —	3.58188
3) 3818 (1272 $\frac{2}{3}$ Leagues.		

2, For the Difference of Longitude.

THIS needs no Calculation, being the same with Meridional Diff-Latitude, in a N. E. Course, viz. 5083, or 84 Deg. 43 Min.

3, For

3. For the Distance in the Arch.

As Tang.	75 0	_____	_____	_____	_____	_____	10.57194
To Rad.		_____	_____	_____	_____	_____	10.00000
So Sine Comp.	84 43	_____	_____	_____	_____	_____	8.96417
To a Tangent required,	1 25	_____	_____	_____	_____	_____	8.39223
As Sine Comp.	1 25	_____	_____	_____	_____	_____	0.00013
To Sine Comp.	15 0	_____	_____	_____	_____	_____	9.98494
So Sine Comp.	58 35	_____	_____	_____	_____	_____	9.71705
To Sine Comp.	59 45	_____	_____	_____	_____	_____	9.70212

59 45
60

3)3585 (1195 Leagues Distance in the Arch.

28

15

Proved otherwise thus.

Sine Comp. Lat.	75 0	_____	_____	_____	_____	_____	941293
Sine Comp. Lat.	30 0	_____	_____	_____	_____	_____	993752
Sine $\frac{2}{3}$ Diff-Longitude	42 21 $\frac{2}{3}$	_____	_____	_____	_____	_____	982850
							Again, 982850
							Sum, 3 9.00752

Natural Sine belonging to 900752, is	_____	_____	_____	_____	_____	_____	101635
							Again, 101635
Verfed Sine of Diff. of the Sides	45	_____	_____	_____	_____	_____	292892
Sum is verfed Sine of	59 45	_____	_____	_____	_____	_____	395163

That 59 45 is the Distance in the Arch,
20

1195 Leagues, the Distance in the Arch of a Great Circle as above.

4. For the true Meridian Distance.

As Rad.	_____	_____	_____	_____	_____	_____	10.00000
To Sine Comp. Lat.	75 0	_____	_____	_____	_____	_____	9.41299
So Diff-Longitude,	5083	_____	_____	_____	_____	_____	3.70612
To Meridian Distance	1316	_____	_____	_____	_____	_____	3.11911

3)1316(438 $\frac{2}{3}$ Leagues Merid. Distance,

11

26

E

PROB.

P R O B. VI.

One Latitude, Distance, and Difference of Longitude given, to find the Rest.

SUPPOSE two Places, one at *B* in Latitude 30, and the other between the N. and E. Distant from it in the Arch of a great Circle 1195 Leagues, and in Longitude East from *B*, 84 Deg. 43 Min.

TAKE in your Compasses the Distance 1195, and with one Foot in *B*, turn the other about, till it cuts the Meridian; that is, 84 43 in Longitude East from *B*, which will fall in the Point *G*, then is *G* the other Place required, and the Latitude is found as by *Prob. 1.* and the rest as in *Prob. 5.*

P R O B. VII.

One Latitude, Course, and Distance given, to find the other Latitude, Meridian Distance, and Difference of Longitude.

A Ship at *B*, in Latitude 30 North, Sails N. E. 3818 Miles, or $1272\frac{2}{3}$ Leagues.

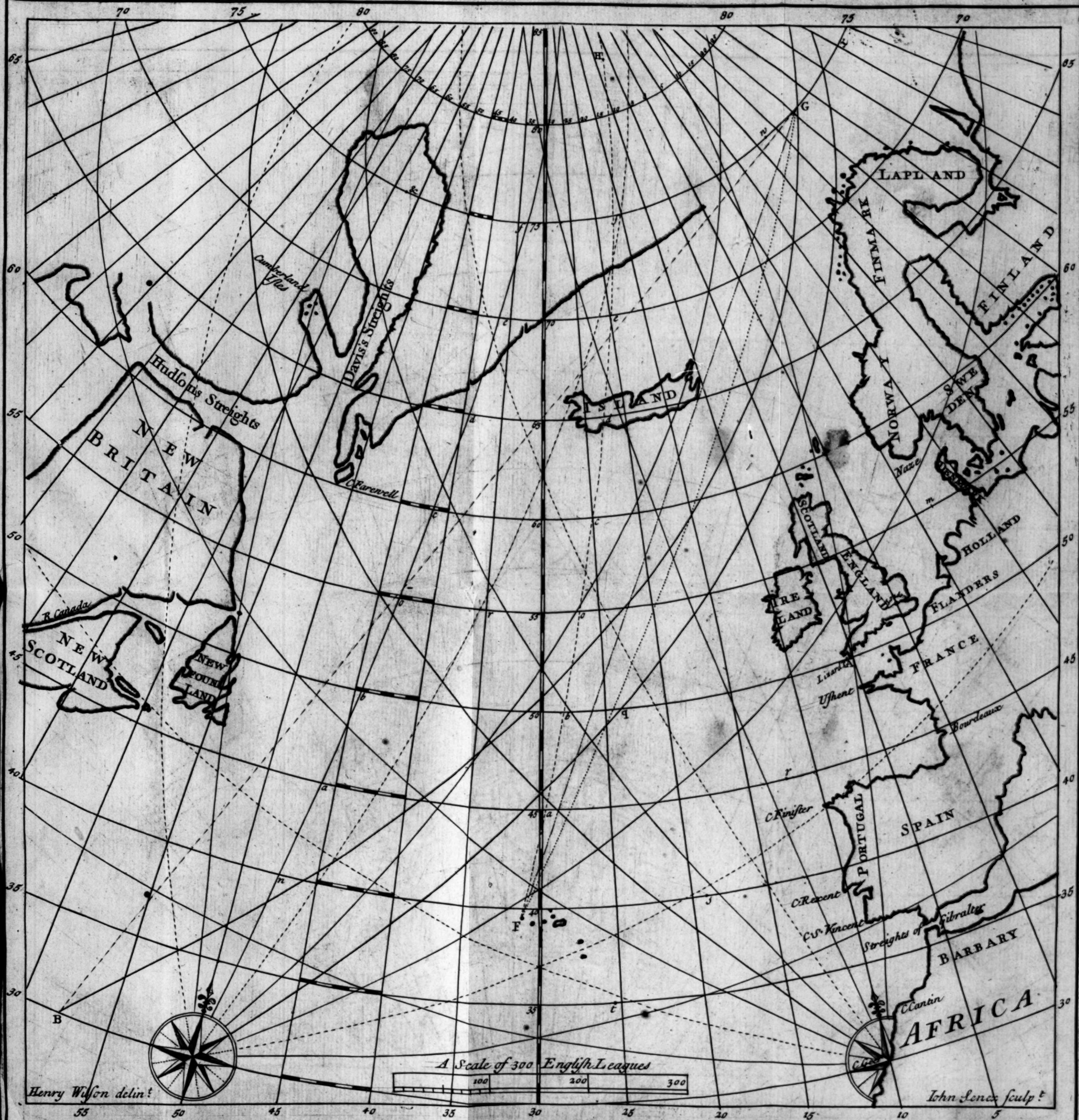
FROM *B*, draw the N. E. Rumb *BG* by *Prob. 3.* upon which, set off the given Distance $1272\frac{2}{3}$ Leagues to *G*, the rest are all found as in *Prob. 5.*

I might have instanced in other Varieties; but this is sufficient to prove that the Globular Projection (if truly and carefully performed) is capable of answering all Cases of Practical Navigation, with Respect to Course, Latitude, Longitude, Distance in the Rumb, and Distance in the Arch of a great Circle; and what Mr. *Hafelden* has said, tho' unjustly, that the *Mercator's* Chart is not capable of expressing, *viz.* Meridian Distance. This I say, I think, sufficient to convince the truly impartial Part of Mankind, of the Truth and Excellency of the Globular Projection, and of the invalidity of the Arguments of those who would deprive the World of any Improvement, though never so excellent; perhaps, because themselves were not the first Inventors or Promoters of it, or because it thwarts their private Interest; but I presume, the World will be wiser than to confine themselves to see with those Mens Eyes, and deny themselves the Use of their own Reason.

IF any Thing like an Objection can arise against this small Specimen being graduated but to every five Degrees, I answer, that all the Charts themselves will be graduated to every Degree, or every two at least: So that in the *Atlas*, that Objection will be quite remov'd, and all other seeming Difficulties render'd easy, and illustrated more largely than this small Peice will admit of, as any that propose to subscribe, shall be instructed and fully convinced, if they require it.

PERHAPS, Mr. *Hafelden*, may Object against my fixing my Calculus upon Mr. *Wright's* Foundation, *viz.* the Table of Meridional Parts, or additional Secants, or (by him) the Table of Latitudes; to this, I answer, as our Design is to spare for nothing that may contribute to bring Navigation to its greatest (possible) Perfection,

The True GLOBULAR CHART



fection, we have declined all Biggotry to Falshood on one Hand, and all Prejudice against Truth on the other, and have for the Improvement of Navigation, followed what is demonstrably true, whether our own, or what other Persons have had the Honour to be the Inventers of: Now that this was always of free Choice, is evident from my printed Sheet of Directions; where I have first said, that *Mercator is true in Proportion*, and afterwards made use of that very Calculation, to prove the truth of the Globular Projection. Our whole Design being only to have an agreeable Harmony, between the Result of the Calculation, and the Appearance of the Projection, as between Truth and Truth. Now that that Calculars produceth a *Questita* agreeable to the Globe, is generally Mathematically demonstrable; and and that ours gives the Representation agreeable to that Calculation, and consequently to the Globe; I think, I have sufficiently proved, and as all allow that these Calculations are adapted to the Superfices of the Globe, they are most fitly represented upon a Globular Projection; whereupon the true Result thereof is measured, by so simple an Artifice, as a Scale of equal Parts; whether it be Distance in the Arch, or in the Rumb; or whether it be Difference of Longitude, or Meridian Distance, or any Thing that is capable of being express'd or imagined upon the Surface of the Terraqueous Globe: So that the Truth of Navigation, as proposed in the Globular *Atlas*, is reduced to so easy a Calculus, as that of a Right-angled plain Triangle, and to so true a Representation as the Globe it self, upon which it is performed.



E 2

P O S T -

P O S T S C R I P T

TO

Mr. HASELDEN.

S I R,

WHEN I first saw your Book with your Letter to Dr. *Halley*, I was a little startled, expecting there had been something in it either in Vindication of the *Mercator's* Projection, or in Condemnation of the Globular one, but upon an impartial Examination of the Contents, I found no such Thing, *viz.* neither so much as one good Argument in Defence of the one, and peculiar to it, nor any thing material against the other; however under that Pretence you have endeavour'd to introduce your Insinuation to Dr. *Halley*, to draw his good Opinion (if possible) from the Globular Projection, without so much as giving him one Reason why he should do so, only tell him, what I have said of one or the other, all which he knew before doubtless as well as you could tell him. However, because Truth shall not need to hide its Head, and I would do you and the World Justice, I have fully answer'd, not only what you have said, but what it may seem you would have said; and for that Purpose I have also drawn a Globular Chart, which though as extensive as yours, yet I have deviated from your Copy, 1st, in drawing mine true, whereas I shall prove yours false. 2^{ly}, I have plac'd my first Meridian more East than you have done, to make more Sea-Room to the Westward, of Purpose in your own Language, to answer that poor trifling Objection you made in Page 6 of your Letter; and to let you see that if the Projection is true, it will answer above 1000 Leagues as well as to 50. But you and your Accomplices apprehensive of the universal Applause that such an excellent Invention must unavoidably meet with in the Opinion of all knowing and unprejudiced Persons, and of the Detriment that must consequently accrue from hence to Things less valuable, and finding it back'd with so good Authority as his Majesty's Letters Patent, you are at a Loss to know on which Side to attack us; the real Value of the Thing, and the Authority by which it is secured, being a sufficient Defence against all Opposers, except you can invalidate one or the other, or both. And therefore, like a cunning Adversary, you have falsely insinuated to the World, First, that it is not a *New Projection of Sea-Charts*, thereby to lessen our Authority; and Secondly, that it is not True and Practicable, thereby to diminish Peoples good Opinion of its real Value. Now, Sir, to let the World see how much you in both these Assertions express your groundless Malice and affected Ignorance, I am well assur'd

1st, YOU never saw a Sea-Chart, or what ought properly to be called a Sea-Chart, without any Rumb-Lines upon it; or if I had made a Draught or Plat without any Rumbs, would not you have thought I had deserv'd the just Censure of all Navi-

Navigators, if I had publish'd such a Thing by the Name of a Sea-Chart, I suppose the Answer to this is evident.

2ly, THEN as to that Chart of *Blundevile's*, it had no Rumb-Lines upon it, nor did he or *Mercator* give any Directions for drawing them, nor did they so much as mention Rumb-Lines. All this I prove by the Book, to any Persons that desire it; how then can you say, it is *the very same as the Globular Chart*, when it wants the very Essentials of a Sea-Chart; nay has not so much as the Name. Or how can you with the same continued Assurance assert, that ours is no new Invention of Sea-Charts, when that which you produce as being before it, neither had the Ornament, nor was capable of being applied to the Use, or Answering the End of a Sea-Chart.

Secondly, YOU would insinuate that it is false, or that by I do not know what Difficulties that attend it, it is not practicable at Sea——To this I answer,

1st, THAT your Ignorance is not enough to prove your Assertion, and all will own, that your drawing a false one is not sufficient to prove ours to be so. If you made yours false through Malice, you are partial; if through Ignorance, you have undertaken what you are not capable of, and in either Case very unfitly qualified to be a Judge, much less to determine the Fate of so valuable an Undertaking. Now that your pretended Globular Chart is false, I thus prove,

1st, THE Squares contained between any two Parallels and two Meridians, should have its Diagonals Equal; but yours differ by 12 or 15 Leagues in so small a Space as 5 Deg. of Long. and 5 Deg. of Latitude: And tho' I would willingly allow for tolerable Errors occasioned by the Shaking of the Hand, or Slipping of the Engraver, which may be contracted even in drawing Lines, designed to be parallel, yet the Tendency of your Projection drawing all your Errors the same Way, that are in the same Part of your Projection proves your very Foundation false.

2ly, THAT you either know not how to draw a Rumb of the same Denomination with one already drawn; or have wilfully and maliciously drawn it wrong, I have prov'd of your North-by-East-Rumb, Page 17. However wrong it is, and grossly too, and therefore your *Globular Chart* is therein false. But if you think I have done you wrong in asserting yours to be false, I will appeal to your self, and you shall be your own Judge.

THEREFORE, Mr. *Hafelden*, pray is your *Globular Chart* right or wrong; if you prove it right, you thereby prove a Possibility of drawing another as true as that, &c. and that all the Parts of the World may be truly represented upon a Globular Projection, which is what we assert, and in which you at this Rate join with us, and overturns the whole Drift of your own Arguments. But if you own your Draught which you call *the Globular Chart* to be false, that will be a generous Acknowledgment of your Ignorance of the very Nature of the Projection, and prove you incapable of maintaining the Argument you have undertook, because I have answer'd you with one that contains all the Space in which your Arguments are comprized, and much more than you required, and yet so exactly true as to agree with Calculation, which if you can do, it may be done, but if you cannot, it is owing to your Deficiency, because I have done it, and here it is offer'd to Examination.

AND

AND that what I call the *True Globular Projection*, is practically true; and that you your self shall proclaim it so to the World, or hold your Peace for ever, pray answer me the following Queries, in which if you will not do me Justice, yet the impartial World will, for having the Foundation of the Answers in this same Book, and directed to by the Pages or Problem, there is no Room for Prevarication.

1. WOULD you insinuate, that the Distances cannot be truly set off upon a curving Rumb.

HAVE not I prov'd Page 23, that the Error does not account to one Mile in 300 in Lat. 74. and much less nearer the Equinoctial.

2ly, WOULD you alledge the Difficulty of taking up an Intermediate Rumb.

HAVE not I herein (*Prob. 3*) given a Method to do it, and that both plain, easy, true, and mathematically demonstrable.

3ly, DID you think that you had found out a material Argument, when you bid me suppose 800 or 1000 Leagues, &c.

HAVE not I suppos'd and perform'd too, between 1200 and 1300 in the Rumb, and that too extends to Lat. 75; and does not it measure as exactly, without straining or forcing, as you can measure 40 Leagues upon a Right-lined Projection.

4ly, HAVE you made good your positive Assertion, that *Blundevile* made a *Curve-lin'd Chart* 167 Years ago, the very same as our *Globular One*?

HAVE not I prov'd that there is no Rumb-Lines drawn in it, nor Directions for them; nor were they so much as mention'd: Nay, were not we the first that ever express'd Rumbs, upon a Curve-lin'd or Globular Projection; or if you can produce any that have attempted to do it, were not we the first that perform'd, explain'd, and publickly applied it to practice? Or was it possible without Rumb-Lines to apply it to the Use of a Sea-Chart? Or were you in such an Extasy upon the suppos'd Discovery, that you forgot that he had left them out, and yet that they are absolutely necessary in a Sea-Chart; pray consider, and then tell me impartially, whether his Chart made 167 Years ago be the very same as our *Globular Chart*.

5. DID you promise to prove the Globular Chart false by 20 in 40.

HAVE not I prov'd that the very Rumb by which you pretended to prove it so, was it self false by above thirty in fifty: Or are you able to prove it false two in forty, as I have desired you to do, which if you can, let us know; but if you cannot, then be ashamed of your Assertion.

6ly, HAVE you prov'd any thing false that I have asserted on one Side or the other, and for the asserting of which you charge me with *superlative Insolence*; methinks had you look'd upon your self as a Gentleman (nay a sober Man) you would have disprov'd my Assertions before you had wrap'd up so much *Billingsgate* in white Paper, to send to such a Gentleman as *Dr. Halley*, that might have been done Time enough when you had detected me; which if you cannot do, pray Sir, do not charge me with
super-

superlative Insolence for telling Truth, as you will confirm the World in a Belief, that it is if you do not confute me; for any Body will believe by your Language, that you did not want Good-will, had it been in your Power; but you have done with them as you have done with the rest of your *trivial Things*, which are easily refuted as you say, yet I do not see that you go about to refute them, you leave that for them that are able, and wisely content your self with what your Genius is capable of.

7ly, YOU say, *They have other Objections, &c.* Have you remov'd them? Nay have you done what any tolerable Artist might have done towards it; if not, how vain you are in mentioning them!

8ly, YOU say, *You might have dissected these Proposals, &c.* Pray what have you been doing all the While? Have you not taken them and the Directions too by single Clauses, Sentences, or Paragraphs: Nay have not you insisted upon a single Word [Apparently] [Proportionably] [Globular] &c. and yet would insinuate, that you might have done more, when you have already done more than is consistent with good Mathematicks, good Sense, good Manners, or with it self. For the first and last look upon your N. by E. Rumb; for the second upon this 8th Query, and for the third consult the Whole of your Letter.

LASTLY, you say, *you could observe many other Deficiencies and Absurdities, &c. but you decline it, for Fear you should trespass too far on the Doctor's Patience, &c.* This modest Apology I take to be the handsomest Expression in your Book, and inferior to none in Truth. That you have trespass'd upon his Patience, you may easily believe, for I suppose he never had in his Life (much less since his Name has been so famous) such a Dish of *Billingsgate*, as you have entertain'd him with in your Letter; nor such a common trifling Piece of Instruction, as is contain'd in your Book, fit only for School-Boys, but too low and mean a Present to one of whom you have justly said, he *has happily penetrated into the profoundest Secrets of Nature*: But that this Paragraph may become a Query, Pray, Sir, where is the Absurdity of representing the Surface of the Globe by a Globular Projection? Where is the Absurdity of representing Inclining Meridians, Curving Rumbs, and Equidistant Parallels upon one, by Inclining Meridians, Curving Rumbs, and Equidistant Parallels on the other; or where is the Deficiency, when you may measure the Distance in the Rumb, the Distance in the Arch, and the Meridian Distance, by one Scale of Equal Parts; or take up a given Rumb from any Place assign'd by a Method Mathematically demonstrable as well as ready and expeditious, if you could have prov'd the Globular Projection incapable of this you should have said so, but because you could not, you wisely say, you *rather decline it*, as you are forced to do all the Rest of your pretended Arguments against it: And as you have let the World see by your Language what you would have done, so you have let them see by your Performance what you can do, and leave them to have a better Opinion of what you oppose, than they had before.

Now Mr. *Hafelden*, lest you should behind my Back undervalue me, or give out, that my Answer is insufficient (which in it self is cowardly Treatment, against which there is no present Defence) I would have you show such your Correspondance this my Request to you, viz. that before you vilifie any Performance of mine, you would first justify your own, more especially those Particulars, which you have asserted in your Book.

First, TO Refute those trivial Things, which (you say) are easily Refuted.

Secondly, TO prove from any Thing that I have printed or said, that your Curve *FG*, is a N. by E. Rumb, by the Directions I give: Nay, to defend yourself from a downright Falshood, in asserting, (Pag. 9 of your Letter) that I directed to draw a Parallel, supposing to a N. E. by N. for a N. E. by N. without any further Directions, to allow for the Inclination of the Rumbs, when my Directions (which you have in this Book Verbatim), say, that the same Rumbs in different Parts of the Chart are not Parallel, &c. Now, Sir, one is my Direction, the other your Comment upon it; and if you can reconcile them, let me know; and if you do not care to be at the Charge of a publick Reply, please to meet me at any Place, before any Mathematician, and there prove the Truth of what you have asserted in your Book, or be ashamed of it for ever.

Thirdly, TO prove (what you virtually affirm Pag. 2 of your Book) that Distances upon the Mercator's Chart, may be measured by a Scale of equal Parts.

Fourthly, TO prove that *Blundevile* ever made a Sea-Chart the very same of our Globular one: Nay, prove that ever he made a Curve-lined Chart with Rumbs upon it; without which, it would be very improper to call it a Sea-Chart, much less a Sea-Chart, the very same of our Globular one.

THESE, and other Assertions in your Book, when you can Justifie without Quibbling, or taking Things by Halves, your Argument will be upon the same Foot as before; but till then, I shall remain fully satisfied of your Inability to maintain those your Principles, and leave all Mankind to judge, what must then become of the Consequences, when you cannot justifie what you have alledged in so much as one of those four Articles; upon which, your chief Arguments are grounded, without overthrowing your own Teaching, and contradicting your own Reason.

A P P E N D I X.

I HAVE seen a Peice writ by Mr. *John Collier*, which had it been worth the answering, I should have taken some Pains with it by it self; but supposing both equally concerned in the same Argument, and equally qualified for defending it, his Answer may do as well here.

HE proposed to me some Queries, the first was,

WHETHER any Place under the Equinoctial, bears East from *London*, that lies in Lat. 51 32 North?

HE answers, yes, and would prove it thus, If a Mariner's Compass be placed at *London*, when the Sun is arising in the Equinoctial, the Sun ariseth East by that Compass (supposing it have no Variation) but the Sun is then Vertical to some Place under the Equinoctial, therefore that Place to which the Sun is Vertical at that time is East from *London*. Thus Mr. *Collier*.

BUT

BUT I answer, There is no Place under the Equinoctial; nay not that Place to which the Sun is Vertical, when in the Equinoctial, and rising to us, which I thus prove:

1st, IF that Place bear East from London, London bears West from it; let us therefore suppose our Mariners Compass, remov'd from London to that Place under the Equinoctial: I suppose you will allow that the West Point of that Compass, would point along the Equinoctial; now if a Line drawn from that Place to London, be a West-Line, and from that Place along the Equinoctial, be also a West-Line, then a West-Line may make an Angle of $51^{\circ} 32'$ with another West-Line drawn from the same Place which is absurd.

BUT we may hence see the Necessity of knowing the Rumbs to be Curves; the Want of which Knowledge, I suppose, led Mr. Collier into this Error, which he endeavours to support, by another as bad, *viz. That sailing upon any oblique Rumb, you will never arrive at a Place that lies in that Rumb.* But the East and West Rumb of the Mariners Compass look'd upon as a Right-Line, and truly parallel to the Horizon, Points out the Great Circle, not the Rumb; nor can it (as a Right-Line) be any more look'd upon as a Part of a Parallel, than a very small Part of a Tangent Line at the Point of Contact can be said to be an Arch or Part of that Circle, to which it is a Tangent, or so small a Part of the Circle, to be a Part of the Tangent Line, which altho' the bare Eye cannot discover in so small a Space, yet if both be continued, they will readily be found to separate as one proceeds in the Line, the other in the Periphery of the Circle; and for the same Reason, tho' the great Circle in so small a Space as the Breadth of a Mariners Compass, may seem to coincide with the Parallel; yet it is not really so, the contrary appearing plain, when both are continued under their respective Denominations; but we see what raw, undigested Matter People will jump at, when they only argue for Arguments sake, and act from no better a Principle than to oppose a Practical Truth, no Wonder if such Persons run counter in their Arguments, and contradict themselves and one another, and catch at any thing right or wrong, to support their Arguments, all which that our Authors have both done, I shall further prove.

2^{ly}, THE Mercator's Projection of Sea-Charts, is not capable of expressing any such Thing as a Possibility of any Place under the Equinoctial, bearing East from London; therefore, if the Mercator's Chart be true, his Assertion must be unavoidably false; or if his Assertion be true, Mercator's Chart is Erroneous, it being absolutely impossible to reconcile one to the other in this Respect. I wish our Author could tell us which one of them to believe, and not detect himself of an Error in the other.

IT is no Wonder, if from such an absurd Foundation, the Deductions be proportionally inconsistent; as indeed, his Conclusions are, when he says; *If a Ship sails East, she will never come at any Place that bears East from her, &c.* and the same he asserts with Respect to any other Rumb. Here (if what Mr. Collier has said be true) he has given the fatal Stroke to Mercator, and all Right-lined Projection for.

1st. HE asserts a Property of the Globe that cannot be express'd upon Mercator's Chart, *viz. that some Place in the Equinoctial bears East from London.*—2. If two
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Places in the *Mercator's* Chart lie in the same Rumb, that Rumb is thereupon represented to be the Way from one to the other : (Nay, and the nearest Way too, tho' the Contrary is allowed by all that understand the Nature of a great Circle) he says, the quite contrary; and that sailing upon any oblique Rumb, you will never arrive at a Place that lies in that Rumb, *viz.* that sailing, suppose South-East, you shall never arrive at a Place that bears South-East from you, &c.

HAVING thus seen Mr. Collier's inconsistency with himself, let us see how Mr. Haselden agrees with himself; and lastly, how the two agree together.

Mr. Haselden, says, pag. 2. of his Book, speaking of the *Mercator's* Chart, *They readily apprehended that, to represent the true bearing of Places by right Lines.— And to measure their Distances too by a Scale of equal Parts, were Things so truly wonderful and useful, that they could not but think, that the Ingenious would esteem them Inducements sufficient to introduce this Chart into the World, &c.* If Mr. Haselden means here, that the *Mercator's* Chart may be measured by a Scale of equal Parts; why, does he afterwards in the same Book make us Scales of unequal Parts to measure it by, and tell us in his Title-page, that by his new Scale, a Distance may be measured at one extent of a Pair of Compasses; or what need have we of his new Curve-lin'd Scale, if a Scale of equal Parts will do; but if a Scale of equal Parts will not do, how can that which it never was capable of, be a sufficient Inducement to introduce it into the World, being inconsistent with the Nature and Original of it: The Degrees of Latitude, each of which contains an equal Number of Miles; yet, being unequal upon the Projection as he observes in the very next Paragraph, where he tells us, *the apparent Distance is most commonly longer than the true*; but which way he will go about to Measure the true Distances by a Scale of equal Parts; or if he cannot, then how that Excellency, that it has not, could introduce it into the World, I believe will puzzle him to unriddle.

AGAIN, our Author, says, pag. 12. of his Book, that *Mercator's* Chart hath no Lines in it, expressing Departure or Meridian Distance; and pag. 14. calls that Deficiency an Excellency, and yet pag. 19. tells us, how to make a Scale for measuring the Distance of Places that lie East and West of each other. Now whether Departure or Meridian Distance be not East and West-Distance, is (I suppose) out of Dispute; and if it is, and cannot be measur'd, what Use is his Scale of? Or is not it absurd, to make a Scale to measure that Thing (as he calls it) which cannot be express'd: And whether Mr. Haselden, would draw Mr. Hodgson in to his Assistance, I am not certain: Or what Opinion Mr. Haselden has of his Performances, is difficult to determine, for he speaks in Pag. 2. of his Book, with the greatest Applause of Mr. Hodgson's Theory of Navigation, in these Words.—But if any one is so obstinate as not to believe on Authorities, tho' such great ones as these, he will have the Opportunity very shortly of consulting a Book (it being now in the *Press*, and will be contain'd in Two large Volumns in Quarto) written by that ingenious Gentleman Mr. James Hodgson, Teacher of the *Mathematicks* at *Christ's-Hospital*, wherein that excellent Author hath put the Truth of *Mercator's-Sailing* past Dispute; and has done that Justice not only to this, but to all the other Parts of *Navigation*, the *Sphere*, *Astronomy*, &c. and in so regular a Method, that I don't doubt but the World will soon be convinc'd, that it is the best Piece of its Kind extant.

HERE

HERE he mightily applauds Mr. *Hodgson's* Method, and more particularly with Respect to the Improvements he has made in *Mercator's* Projection, and the Calculations relating thereunto, as if it was the very Apex of all the Improvements that *Mercator's* Sailing is capable of; and yet, a little afterwards tells us, that what Mr. *Hodgson*, amongst other Authors call Departure, or Meridian Distance, cannot be express'd upon *Mercator's* Chart, and that these Authors are false, in what they call Departure, were Mr. *Hafelden's* Words to me. Is Mr. *Hafelden*, going to overthrow what he commends Mr. *Hodgson* so much for the Improvement of: Or must he, as well as other Authors, recede from what they have publickly asserted, or submit to lie under his Censure: Methinks if this be so, that all these Gentlemen continue to espouse an old Error; and Mr. *Hafelden*, such a publick spirited Man, as to write without any View of private Interest; he should publish a Book to set Sailors to Rights in that Respect; also, as he was pleased to give out, that he did, when he writ against us, and he would soon find he had some Body else to deal with as well as the Authors of the Globular Projection.

I might have enumerated more of Mr. *Hafelden's* Inconsistencies, as his proving the Truth of what he said about Departure or Meridian Distance by a rough Specimen of that very Globular Projection, which himself has all along been decrying with the most diminutive (not to say scurrilous) Expressions; which was it so indifferent, nay so false as he would insinuate, methinks should not be a sufficient Illustration of a Thing of such Consequence, and what I should yet have admir'd more at, had it been in any Authors Book but his, is, that after he has taken so much Pains to illustrate what Meridian Distance is, and make it intelligible, he tells us directly, that it cannot be express'd in the *Mercator's* Chart, which if so, it seems impertinent to give such an Illustration of it in a Book of the Description and Use of *Mercator's* Chart. But let that pass amongst the rest.

BUT as I suppose Mr. *Hafelden* will not fail to take all Advantages to prop up his own Argument, and cut down mine as his Contemporary and Fellow-Author Mr. *Collier* was pleas'd to express himself, perhaps he will make the World believe that he has a Charge of Self-Contradiction against me in first blanning him for Disproportion, viz. That his Letter bear (proportionally) a greater Share in the Book than in the Title; and at the same Time follow the same Proportion (or rather Disproportion) in my Answer: But this is easily defended, when it is consider'd, that my Book is an Answer to his, in Defence of the *Globular Projection* which he has lost so much Time to expose: And therefore in this Case I am not tied up to the common Order and Proportion of Books in general; but of his in particular, which I think is a sufficient Apology for following his Steps in this Case.

HAVING now examin'd both his Work and Mr. *Collier's*, and shew'd how each contradicts it self, let us next see how the two agree together for a pleasant Harmony between two so zealously concerned in the same Cause, would be a powerful Inducement to indifferent Persons, to be convinced of the Validity of their Arguments.

NOW Mr. *Collier* says in his Book, that the Rumbs terminate in the Poles, and would make it as great a Truth as that all the Parts are Equal to the Whole. Mr. *Hafelden* says, they do not, in these Words pag. 9. of his Letter, That the Rumb-Lines do
by

by certain Revolutions approach the Poles, but though these Revolutions are infinite in Number, yet can the Rumb-Lines never fall into the Poles, &c. I shall suspend a Decision of the Debate, tho' a demonstrable one may be given, but it is sufficient that the World be forewarned, what they may expect from the Arguments of those Men that differ in their very Fundamentals.

AGAIN, Mr. *Hafelden* in the last Paragraph of his Letter calls *Mercator's* Projection (I suppose) the most excellent Invention the World ever saw, &c. and yet (as I observed before) it teaches us, that sailing upon the Rumb, that a Place lies in from us, will carry us to the Place: Mr. *Collier* says in express Terms, it will not. Which shall we believe? If they did not both expect to be believ'd, they have only expos'd their Folly in Writing; if they did, one of them has bewray'd his Ignorance, if not both; and indeed upon this Occasion I must beg Mr. *Hafelden's* Pardon, if I borrow his own Expression, that take his Book and Mr. *Collier's* together, they make a compleat *Jargon of Words*.

DOUBTLESS was both these Gentlemen examin'd about the Truth of their different Assertions, they would each endeavour to justify himself, which in Things so evidently contradictory, one or both must recant, or maintain a Falshood; and how far the Reputation of such Persons will contribute to the Force of an Argument; the World may judge; in the mean time, if they persist in such a clashing and self-contradicting Way of opposing a self-evident Truth, their Arguments will excite our Contempt rather than Concern, as finding by their Ability, that they are not able to hurt any Body but themselves, and may say of them as *Titus Vespasian* (when upon the Siege of *Jerusalem*) said of the Captains within the City, when he observed their intestine Broils and Sedition among themselves, *Let them but alone, they will destroy one another.*

F I N I S .

